REPUBLIC OF RWANDA

MINISTRY OF INFRASTRUCTURE (MININFRA)

P.O. Box 24 Kigali

ENERGY DEVELOPMENT CORPORATION LTD

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

FOR

CONSTRUCTION OF 110 KV DOUBLE CIRCUIT CUT-IN CUT-OUT TRANSMISSION LINE KIGOMA SS – MT KIGALI SS (21 KM)

Kigali, November 2026

Table of Contents

Acronyms and Abbreviations viii

Executive Summary 1
Overview of the Project 1
Major and Moderate Environmental and Social Risks and Impacts 4
Positive Impacts 4
Negative Risks and Impacts 5
Risk Classification 6
Stakeholder Consultation 6

Chapter I: Introduction 8
1.1 Context and Objectives of the Environmental and Social Impact Assessment 10
1.1.1 Immediate Objectives of the ESIA 10
1.1.2 Long-Term Objectives of the ESIA 10
1.1.3 Specific Objectives of the Study 11
1.2 Benefits of Access to Electric Power 11
1.2.1 On Poverty and Hunger 12
1.2.2 On Health 12
1.2.3 On Education 12
1.2.4 On the Improvement of Living Conditions, Particularly for Women 12
1.2.5 On Decrease of Rural Exodus 12
1.2.6 On Environment 12
1.2.7 Project Justification and Rationale 13
1.3 Methodological Approach 13
1.3.1 Desk Review 13
1.3.2 Data Collection Methodology 13
1.3.3 Impact and Risk Assessment Methodology 15
1.3.4 Determination of Significance 17

Chapter II: Policy, Legal and Institutional Framework 18
2.1 Strategies and Policies 18
2.1.1 The National Strategy for Transformation (NST2) 18
2.1.2 The National Environment and Climate Change Policy (MoE, 2019) 18
2.1.3 The Green Growth and Climate Resilience Strategy / National Strategy for Climate Change and Low Carbon Development (2011) 19
2.1.4 The National Biodiversity Strategy and Action Plan (NBSAP 2025–2030) 20
2.1.5 The National Forest Policy (2015) 21
2.1.6 The National Wetlands Management Policy (2015) 21
2.1.7 The Rwanda Energy Policy (2015) 22
2.1.8 The Energy Sector Strategic Plan (2024/2025 – 2029/2030) 23
2.1.9 The Rwanda Rural Electrification Strategy (2016) 24
2.2 Legislation 24
2.2.1 Constitution of the Republic of Rwanda 24
2.2.2 Law on Environment (N°48/2018 of 13/08/2018) 25
2.2.3 Law Governing Land in Rwanda (N° 27/2021 of 10/06/2021) 27
2.2.4 Law Determining the Management and Utilization of Forests in Rwanda (Nº47bis/2013 of 28/06/2013) 28
2.2.5 Ministerial Order No 006/MINIRENA/2015 of 18/06/2015 Determining the Management of Protected State Forests Not Governed by Special Laws 28
2.2.6 Ministerial Order No 008/MINIRENA/2015 of 18/06/2015 Establishing a List of Protected Trees 29

2.2.7 Law Governing Biodiversity in Rwanda (N° 70/2013 of 02/09/2013) 29
2.2.8 Ministerial Order Establishing the List of Protected Animals and Plants Species in Rwanda (No. 007/2008 of 15/08/2008) 30
2.2.9 Ministerial Order No 003/MoE/25 of 19/08/2025 Relating to Environmental and Social Impact Assessment 31
2.2.10 Prime Minister's Order No 008/03 of 26/04/2021 Governing Environmental Protection Committees and Their Members 31
2.2.11 Instruction Issued by the Rwanda Environment Management Authority (REMA) and Governing Inspection Process in Environmental Matters (No 001 of 10/01/2020) 31
2.2.12 Law Governing Electricity in Rwanda as Modified to Date (No 52/2018 of 13/08/2018 – modifying law No 21/2011 of 23/06/2011) 33
2.2.13 National Social Protection Strategy (MINALOC, 2011) 34
2.2.14 Law Regulating Labour in Rwanda (N° 66/2018 of 30/08/2018) as Amended on 08/05/2023 34
2.2.15 Ministerial Order Nº 02/MIFOTRA/22 of 30/08/2022 on Occupational Safety, Employees' and Employers' Organizations, Child Employment, Employment of a Foreigner, the Child and Circumstantial Leave. 35
2.2.16 Ministerial Order 6 of 2010 Determining the List of Worst Forms of Child Labor, Their Nature, Categories of Institutions That Are Not Allowed to Employ Them and Their Prevention Mechanisms 36
2.2.17 Law N°59/2008 of 10/09/2008 on Prevention and Punishment of Gender- Based Violence 37
2.3 Institutional Framework 37
2.3.1 Environment Institutional Actors 37
2.3.2 Institutional Actors in the Electricity Sector 43
2.4 International Conventions and Treaties 47
2.5 International Environmental and Social Frameworks, Procedures and Guidelines 50
2.5.1 World Bank's Environmental and Social Standards (ESSs) Applicable to the Project 50
2.5.2 World Bank Group Environmental, Health and Safety Guidelines 52
2.5.3 Rwanda ESIA Guidelines and WB-ESF 60

Chapter III: Description of the Project 68
3.1 Description of the Project Sites and Major Environmental Challenges 68
3.2 Scope of the Project 69
3.3 Area of Influence 71
3.4 General Location Criteria 71
3.5 Power Line 72
3.6 Line Characteristics 73
3.7 Operation and Maintenance 75
3.7.1 Right-of-way 75
3.8 Preliminary Schedule and Project Costs 76

Chapter IV: Description of the Current Project Environment (Baseline State) 77
4.1 Environmental Baseline for the 110 kV Double Circuit Cut-in Cut-out Transmission Line Kigoma SS – Mt Kigali SS (21 km) 77
4.1.1 Ruhango District: Biophysical Baseline 77
4.1.2 Muhanga District: Biophysical Baseline 85
4.2 Socio-economic Baseline Data 91
4.2.1 Social Risks, Community Health and Safety, and Labor-Related Issues 91
4.2.2 General Conditions of the PAPs 92
4.2.3 Magnitude of the Expected Loss 93
4.2.4 Socio-economic Baseline for Ruhango District 94

4.2.5 Socio-economic Baseline for Muhanga District 96

Chapter V: Presentation and Comparison of Considered Alternatives 99
5.1 Identification of Alternatives 99
5.2 Analysis of Alternatives 100

Chapter VI: Potential Environmental and Social Impacts 103
6.1 Introduction 103
6.2 Impact Types 103
6.3 Identification of Potential Impacts 103
6.4 Source of Impacts 104
6.4.1 Manpower 104
6.4.2 Works 104
6.5 Nature of Impacts 105
6.5.1 Permanent Impacts 105
6.5.2 Temporary Impacts 105
6.5.3 Power Line 106
6.5.4 Access Roads 106
6.6 Impact Description 106
6.6.1 Potential Impacts During Construction Phase 107
6.6.2 Potential Impacts During Operational Phase 113
6.6.3 Negative Impacts 115
6.7 Climate Hazards and Implications for Transmission Line Infrastructure 117
6.7.1 Flooding and Intense Rainfall 117
6.7.2 Lightning 118
6.7.3 Windstorms 118
6.7.4 Implications for Project Design and Operation 118
6.8 Bird Movement and Flight Corridor Assessment (Avifauna) 118
6.8.1 Summary of Findings 120
6.8.2 Mitigation Strategy Based on Risk 120
6.9 Summary of Potential Impacts 120

Chapter VII: Mitigation & Enhancement Measures 124
7.1 Impact Mitigation Measures 124
7.1.1 Mitigation Measures During the Pre-construction Phase 124
7.2 Mitigation Measures During the Construction Phase 125
7.2.1 Site Organization 125
7.2.2 Solid Waste Management 126
7.2.3 Oil Products Management 127
7.2.4 Protection of Natural Environment and Vegetation 127
7.2.5 Wildlife Protection 127
7.2.6 Water Protection 128
7.2.7 Earthwork 128
7.3 Mitigation Measures During the Operation Phase 129
7.4 Mitigation Measures for Social Impacts 129
7.4.1 Pre-construction Phase 129
7.4.2 Construction Phase 130
7.5 Environmental and Social Management Plan (ESMP) 131
7.5.1 Roles and Responsibilities: REG's Role 131
7.5.2 REG's Environmental and Social Specialists 132
7.5.3 Contractor's Role 133
7.5.4 Role of REG Environmental Officer and External E&S Supervising Consultant 134
7.5.5 RDB and REMA's Role 135

7.5.6 District ... 135
7.5.7 Local Communities ... 135
7.5.8 Other Key Stakeholders ... 135
7.5.9 Physical Cultural Resource (PCR) and Chance Finds Procedure ... 136
7.5.10 Implementing the ESMP ... 137
7.5.11 The Potential Interactions Between the Project and the Resources and Receptors ... 158
7.5.12 Impacts Characterization ... 161
7.5.13 Impacts Magnitude Designation ... 161
7.5.14 Resources and Receptors Sensitivity/Vulnerability/Importance Definition ... 162
7.5.15 Evaluation of Impacts Significance ... 162
7.6 Description of Environmental Effects of Mitigation Measures ... 163
7.7 Grievance Redress Mechanism ... 168
7.7.1 Introduction ... 168
7.7.2 Common Likely Types of Grievances and Disputes ... 168
7.7.3 Grievance Redress Mechanism ... 169
7.7.4 Description of Tasks and Day-to-day Responsibilities ... 172
7.7.5 Worker's Based GRM ... 173
7.8 Technical Subplans ... 174
7.8.1 Avian Protection Plan (APP) ... 174
7.8.2 Wetland Management Plan (Provided in Appendix 6) ... 177
7.8.3 Biodiversity Management Plan (Provided in Appendix 7) ... 177

Chapter VIII: Monitoring Program ... 178
8.1 Environmental and Social Risk Management Specialists ... 178
8.2 Environmental Monitoring ... 184
8.3 Institutional/Organizational and Responsibilities in ESMP Implementation ... 184
8.3.1 Role of the Project Implementation Unit (PIU) ... 184
8.3.2 The Role of REG-EDCL ... 184
8.3.3 Role of REMA ... 184
8.3.4 District Local Authorities ... 185
8.3.5 The Local Leaders ... 185
8.3.6 The Role of the Contractors ... 185
8.3.7 Role of Supervising Consultants ... 185
8.4 Institutional Capacity Strengthening ... 186
8.5 Environmental Awareness and Training Plan ... 187
8.5.1 Responsibility ... 189
8.6 General Emergency Response Measures ... 189
8.6.1 Fire Preparedness ... 190
8.7 Costs Related to ESMP Implementation ... 190
8.7.1 Costs Related to Construction ... 190

Chapter IX: Conclusion and Recommendations ... 191
9.1 Conclusion ... 191
9.2 Recommendations ... 192

References ... 193

Appendices ... 196
Appendix 1: Stakeholder Engagement ... 197
Appendix 2: List of 35 Consulted People in Muhanga District ... 199
Appendix 3: List of 73 Consulted People in Ruhango District ... 201
Appendix 4: Summary of Key Environmental and Social Issues Raised During Consultations in Different Districts of the Project ... 208

Appendix 5: Vegetation Types Crossed by the TL (Estimated RoW).....210
Appendix 6: Wetland Management Plan (WMP) 211
Appendix 7: Biodiversity Management Plan (BMP).....242

List of Figures

Figure 1: Map of Rwanda districts showing location of the project 69
Figure 2: Schematic diagram of 110 kV double circuit tower 75
Figure 3: Mwogo River in Ruhango District 78
Figure 4: Water course draining Nyamugafi wetland 78
Figure 5: Modified Nyabikone wetland (Muhororo and Mpanda cells of Byimana sector) 79
Figure 6: Land Vegetation Cover in Ruhango District 81
Figure 7: Flora in the project area dominated with banana, maize and cassava in Ruhango District 81
Figure 8: Nyamugafi wetland, Muhororo and Mpanda cells of Byimana Sector, Ruhango District 83
Figure 9: Nyabarongo river in Rongi sector of Muhanga District 87
Figure 10: Rugeramigozi wetland in Nyamabuye sector of Muhanga District 88
Figure 11: Administrative Map of Muhanga District 89
Figure 12: Rural Settlements in Ruhango District 94
Figure 13: Soils in the project area 108
Figure 14: Bird species observed in the project sites 112
Figure 15: Interactions of potential sources of impact and potential receptors 161
Figure 16: Grievance Redress structure for the implementation of the project 170

List of Tables

Table 1: Assessing criteria and ratings used for determining impact significance 15
Table 2: Significance rating table 17
Table 3: International Conventions to which Rwanda is party 47
Table 4: World Bank's Environmental and Social Standards applied to the project 50
Table 5: Environmental Health and Safety Guidelines 54
Table 6: Summary of EHS Guidelines for Electric Power Transmission and Distribution 56
Table 7: Gap Analysis Between World Bank ESF and Rwanda National Laws 61
Table 8: Number and location of the Project Affected Households 70
Table 9: Line characteristics 73
Table 10: Crop fields crossed by the Kigoma–Muhanga transmission line in Ruhango District 80
Table 11: Encountered wildlife along the Kigoma-Muhanga Transmission Line 82
Table 12: Main Crop Types within the Affected 52.5 ha Project Area 83
Table 13: Main Tree Types within the Affected Project Area (52.5 ha) 84
Table 14: Vegetation crossed by the line in the district 89
Table 15: Encountered Wildlife along the Kigoma–Muhanga Transmission Line in Muhanga District 90
Table 16: Description of Identified Alternatives 99
Table 17: Analysis of Alternatives 100
Table 18: Comparative Analysis of Alternatives (Environmental and Social Perspective) 101
Table 19: Summary of impacts on the natural environment 107
Table 20: Quantification of negative impacts caused by the proposed TLs 115
Table 21: Estimated Carbon Stock Loss 117
Table 22: Bird Collision Risk Ranking at Wetland Crossings 119
Table 23: The summary of the project's impacts on the natural environments 121
Table 24: Environmental and Social Management Plan (ESMP) for the 110 kV Transmission Line 139
Table 25: Impact Significance Designation Matrix Example 162
Table 26: Impact significance rating example 163
Table 27: Grievance Redress Process for the implementation of project 171
Table 28: Environmental and Social Monitoring Plan 180
Table 29: Detailed capacity building plan 186
Table 30: Environmental Awareness Principles and Topics 188

Acronyms and Abbreviations

7YGP	7 Year Government Program
AFSEC	African Electrotechnical Standardization Commission
AIIB	Asian Infrastructure Investment Bank
AoI	Area of Influence
ASCENT	Accelerating Sustainable and Clean Energy Access Transformation
C-ESMP	Contractor's Environmental and Social Management Plan
CAPP	Central Africa Power Pool
CÉÉAC / ECCAS	Communauté Économique des États de l'Afrique Centrale / Economic Community of Central Africa States
CÉPGL	Economic Community of the Great Lakes Countries (Communauté Économique des Pays des Grands Lacs)
CES	Consultant's Environmental Specialist
CO_2	Carbon Dioxide
CoC	Code of Conduct
CSOs	Civil Society Organizations
DEM	Digital Elevation Model
DEO	District Environment Officer
DRC	Democratic Republic of Congo
DTM	Digital Terrain Model
EA	Environmental Audit
EAPP	East African Power Pool
EARP	Electricity Access Roll out Program
EDCL	Energy Development Corporation Limited
EDPRS	Economic Development and Poverty Reduction Strategy
EHS	Environmental, Health and Safety
EMF	Electric and Magnetic Fields
EMP	Environmental Management Plan
ESF	Environmental and Social Framework (World Bank)
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan

ESS	Environmental and Social Standard
ESSP	Energy Sector Strategic Plan
eSWAP	Energy Sector Wide Approach
ESWG	Energy Sector Working Group
EUCL	Energy Utility Corporation Limited
FONERWA	Rwanda National Green Fund
GBV	Gender-Based Violence
GGCRS	Green Growth and Climate Resilience Strategy
GGGI	Global Green Growth Institute
GoR	Government of Rwanda
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
IUCN	International Union for Conservation of Nature
kWh	Kilowatt-hour
LMP	Labour Management Procedures
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MININFRA	Ministry of Infrastructure
MoE	Ministry of Environment
MV	Medium Voltage
MW	Megawatts
NBSAP	National Biodiversity Strategy and Action Plan
NDCs	Nationally Determined Contributions
NGOs	Non-Governmental Organizations
NLA	National Land Authority
NST1	National Strategy for Transformation – Phase 1
NST2	National Strategy for Transformation – Phase 2
OHS	Occupational Health and Safety
OPGW	Optical Ground Wire
PAH	Project Affected Household
PAP	Project Affected Person
PIU	Project Implementation Unit

PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RAPEP	Rwanda Association of Professional Environmental Practitioners
RDB	Rwanda Development Board
RECO	Rwanda Energy Corporation
REG	Rwanda Energy Group
REMA	Rwanda Environment Management Authority
REP	Rwanda Energy Policy
RFA	Rwanda Forestry Authority
RoW	Right-of-Way
RUEAP	Rwanda Universal Energy Access Program
RURA	Rwanda Utilities Regulatory Authority
RWB	Rwanda Water Resources Board
SADC	Southern Africa Development Community
SAPP	Southern Africa Power Pool
SDGs	Sustainable Development Goals
SE4ALL	Sustainable Energy for All
SEA	Sexual Exploitation and Abuse
SEO	Contractor's Site Environmental Officer
SEP	Stakeholder Engagement Plan
SESO	Site Environmental and Social Officer
SH	Sexual Harassment
SRTM	Shuttle Radar Topography Mission
SS	Substation
TL	Transmission Line
USAID	United States Agency for International Development
USD	United States Dollars
VAT	Value Added Tax
WAPP	West Africa Power Pool
WB	World Bank
YESDP	Young Engineers Skills Development Program

Executive Summary

Overview of the Project

One of the strategic objectives of the National Strategy for Transformation (NST1), which built on EDPRS I and II, and of its successor NST2, is to expand electricity access while at the same time improving quality of supply at the lowest possible cost.

To achieve the said objectives, the Government of Rwanda through the Rwanda Energy Group and its subsidiary, the Energy Development Corporation Limited (REG/EDCL), is planning to implement the "Accelerating Sustainable and Clean Energy Access Transformation (ASCENT)".

The overarching objective of this project is to increase access to reliable energy for households, enterprises and public institutions; and enhance the efficiency of electricity services in Rwanda. The specific objective of the sub-project is to improve grid stability and reliability to enable Rwanda to accelerate the access program with reliability and efficiency under component two of the project.

In this regard, REG/EDCL is conducting the Environmental and Social Impact Assessment (ESIA) to comply with the national and WB ESF to identify, assess, and manage the potential environmental and social impacts, and this study covers the Construction of the 110 kV Double Circuit Cut-in Cut-out Transmission Line Kigoma SS – Mt Kigali SS (21 km). The project crosses two districts namely Muhanga District (Nyamabuye Sector) and Ruhango District (Byimana, Mbuye and Ruhango Sectors), it is the cut in cut out line of Kigoma–Mt Kigali line bringing in power in the Muhanga Substation and taking it out in the line Kigoma–Mt Kigali making it a double circuit line.

The present is the report on Environmental and Social Impact Assessment (ESIA) study that was prepared for the Construction of the 110 kV Double Circuit Cut-in Cut-out Transmission Line Kigoma SS – Mt Kigali SS (21 km), financed by the Government of Rwanda, the World Bank and the Asian Infrastructure Investment Bank (AIIB) under ASCENT Project.

The project involves the construction of a 110 kV double circuit cut-in cut-out transmission line associated with the existing Kigoma–Mt Kigali transmission line. The line is located in the Southern Province of Rwanda, specifically within Muhanga and Ruhango Districts.

The transmission line traverses:

- Muhanga District (Nyamabuye Sector), and
- Ruhango District (Byimana, Mbuye and Ruhango Sectors).

The proposed infrastructure consists of a cut-in cut-out configuration, whereby the existing Kigoma–Mt Kigali 110 kV transmission line will be intercepted to:

- supply power to the new Muhanga Substation (110/30 kV); and
- reconnect to the main transmission line, thereby maintaining continuity of the Kigoma–Mt Kigali network.

This configuration effectively converts the section into a **double circuit transmission system**, improving grid reliability and enabling efficient power distribution to the Muhanga area.

The planned 110 kV transmission lines will specifically help to improve the quality of electricity supply in Rwanda and strengthen the backbone of the transmission network, thus providing additional capacity to cope with the growth of demand, under conditions of safety and quality in line with the requirements of the public electricity service.

The power system analysis of the transmission line and substation using PSS/E and/or DIgSILENT power system analysis models justified the project benefits in terms of technical loss reduction, transit capacity enhancement, safety (N-1), robustness, stability, etc. The simulations will mainly quantify these advantages and disadvantages. The project will generate quantifiable and non-quantifiable technical and economic benefits. As part of the economic analysis of the project, the following benefits are considered, among others:

- Reduction of technical losses; because of better load distribution.
- The increase in energy supply, caused by the access to the network of previously unmet customers because of the capacity limit or the quality of delivery.
- Reduction of CO_2 emissions, through access to the network of new customers.

The increased rate of access to electricity will undoubtedly contribute to achieving the Objectives of the National Strategic Development Plans and Goals.

In this regard, the purpose of this ESIA is to provide the necessary information on the proposed project to guide decisions for the relevant institutions. The ESMP provides guidelines to ensure that the proposed project complies with national environmental law, the WB ESF and good practice. This ESIA Report also proposes mitigation measures to potential impacts that have been identified, which are required during implementation of the proposed project.

The specific objectives of the ESIA are to provide, inter alia:

a) Establish a baseline of existing social and environmental conditions prior to project initiation by collecting primary and secondary data/information on physical, biological and socio-economic environment of the project area, paying special attention to the existing land uses, as well as fragile ecosystems and environmentally important areas, which include wetlands, forests and protected areas, in cognizance of applicable environmental and social risk management by complying with the World Bank Environmental and Social Framework (ESF).
b) A review of policy, legal and institutional framework for the project, providing a summary of important policies, legislation, regulations and guidelines that are likely to be applicable to the project.
c) Consideration and documentation of inputs, concerns and suggestions of key stakeholders regarding the identification, analysis, assessment and mitigation of the potential environmental and social impacts of the proposed project through public consultations with relevant Government Ministries, NGOs / CBOs, community leaders and Project Affected Persons (PAPs);
d) Identify potentially significant environmental and social impacts (both positive and negative) during all stages of the Project. Avoid, minimize, and suggest mitigation and compensation measures for significant adverse impacts; and paying special attention to

direct and indirect gender impacts (access, utilization and reducing the gender poverty gap) of the proposed project activities.

e) Provide a description of the grievance redress mechanism
f) Environmental and Social Management Plan (ESMP) detailing mitigation measures for addressing the identified potential negative environmental and social risks/ impacts of the project and their timing vis a vis the construction and operational phases of the project; and
g) Monitoring plan with clear monitoring indicators, budget estimates and institutional roles for tracking the implementation of and compliance with the proposed mitigation environmental and social measures, including implementation units' capacity building.

The project activities will consist mainly in the following:

- Construction of roads to access work sites.
- Clearing of the line's right-of-way.
- Siting of towers and site installation, including construction of temporary campsites for power line construction activities.
- Excavation works and other earthmoving and tower construction activities.
- Transportation of materials
- Stringing.
- Energizing.
- Commissioning.
- Maintenance (clearing) of the right-of-way during operation phase as a way of permanently controlling vegetation.

The identification of project alternatives includes the consideration of the proponent's 'preferred option', as detailed in the preliminary route design drawings. Other project alternatives are also identified through considering the following aspects:

a) Route alignment and/or location of project activities.
b) Designs of electrical infrastructure and what technology is proposed.
c) Use of alternative technology; and
d) Various implementation methods and techniques.

The above aspects are considered, and the alternatives identified for the project are:

Preferred Option: Overhead Power Lines

This alternative is as proposed in the feasibility study and detailed in the preliminary route designs received for the project, involving overhead power lines. The proposed line routing and Right of Way (RoW) were selected among various options based on a set of technical, environmental, and socio-economic criteria relevant to the Rwandan context. These include:

- Technical feasibility: ensuring optimal line alignment, safety clearances, and compatibility with the existing Kigoma–Mt Kigali transmission line network;
- Minimization of land acquisition and resettlement impacts: avoiding densely populated areas and reducing the number of Project Affected Households (PAHs);
- Avoidance of environmentally sensitive areas: minimizing crossing of wetlands, forest patches, and ecologically sensitive habitats, in line with national regulations;

- Topography and constructability: considering terrain conditions, slope stability, and accessibility for construction and maintenance;
- Existing land use: prioritizing routing through agricultural land and already modified areas rather than undeveloped or sensitive zones;
- Infrastructure optimization: following or aligning with existing infrastructure corridors where feasible to reduce cumulative impacts;
- Compliance with national and international standards: including requirements of Rwanda's environmental regulations and the World Bank Environmental and Social Framework (ESF).
- Reduction of biodiversity risks, including potential disturbance to habitats and avifauna collision risks;

These criteria were applied iteratively during the route selection process to ensure a technically sound, environmentally responsible, and socially acceptable alignment.

Major and Moderate Environmental and Social Risks and Impacts

Environmental risks and impacts of the installation of transmission lines were assessed by using data collected during field investigations, from data collection in offices of ministries and other institutions, review of relevant documents, databases, maps and satellite imagery, as well as consultation with different partners interested in the project, and meetings with the population living in the project area. The following are the major and moderate impacts on the selected environmental components:

Positive Impacts

With regard to social impacts, the study found that positive social impacts will result from the new (or improved) electricity supply, which allows economic development and improvements in living conditions.

The overall positive social impact of the construction of 110 kV Lines in Rwanda can be anticipated by the economic development of the handicraft and especially the agri-business sector. The benefits of the project for domestic supply and use in small-scale businesses and in access to electric power for schools and public services are evident. Supply of pumped water will be facilitated and there will be safer and more efficient operation of key services, through electricity access to villages along the transmission and distribution lines served.

The possibilities of an Electricity Supply Project linked to Poverty Reduction can be seen in an increased income, an enhanced productivity and quality of life, a contribution to Human Development, influenced migration, and by a contribution to security.

The positive impacts during the preparatory and construction phases of power lines are:

(1) The creation of financial income as a result of the temporary jobs that will be created for local workers from the sectors/districts concerned by construction works and compensatory reforestation activities. It is estimated that up to 150 persons will be directly employed by the project for construction works and receiving regular salaries; and

(2) The creation of financial income for local traders including women selling food items along the construction sites.
(3) Job Creation due to the availability of sufficient energy and electricity network strengthening.

Negative Risks and Impacts

During the preparatory and construction phase of power lines, negative risks and impacts are foreseeable, but can be mitigated using appropriate measures. These especially are:

- **Land acquisition and resettlement impacts:** The project will result in permanent land acquisition for tower locations and for houses located within the 25 m Right of Way (RoW). In total, 797 households will be affected, including 64 households losing approximately 1.8 ha of land at tower locations. The remaining affected households will experience loss of crops and trees within the RoW while retaining land use rights after construction. All affected assets will be compensated in accordance with the Law N° 32/2015 of 11/06/2015 relating to expropriation in the public interest and the World Bank Environmental and Social Framework (ESF).
- **Loss of agricultural assets and livelihoods:** The clearing of the RoW will lead to loss of crops, trees, and temporary disruption of agricultural activities, affecting household income and food security.
- **Vegetation loss and habitat disturbance:** Construction activities will require clearing of natural vegetation (herbaceous, shrubs, and scattered trees), resulting in habitat disturbance for small fauna and potential fragmentation. However, low-height crops (e.g., banana trees) may be allowed within the RoW during operation.
- **Biodiversity impacts:** Potential impacts include disturbance to fauna, particularly in modified habitats, and risk of bird collision with transmission lines, especially in open and wetland landscapes.
- **Soil erosion and land degradation:** Excavation works for tower foundations and site clearance may increase soil erosion, particularly in sloped or exposed areas.
- **Water and soil pollution risks:** Improper handling or storage of fuels, oils, and construction materials may lead to contamination of soils and surface water, especially near wetlands and drainage areas.
- **Air quality and noise impacts:** Construction activities will generate dust, emissions, and elevated noise levels, temporarily affecting nearby communities. These impacts are expected to cease after construction.
- **Waste generation:** Construction will generate solid and liquid wastes, including hazardous wastes such as waste oils, which may pose environmental risks if not properly managed.
- **Occupational health and safety (OHS) risks:** Workers will be exposed to risks such as accidents during clearing, excavation, equipment installation, and line stringing, requiring strict adherence to safety measures and use of personal protective equipment (PPE).
- **Community health and safety risks:** Local populations may face risks related to construction activities, increased traffic, and exposure to electrical hazards during operation.

- **Public health risks:** There is a potential risk of spread of communicable diseases, including HIV/AIDS, associated with labor influx and interactions between workers and local communities.
- **Gender-Based Violence (GBV) and social risks:** The influx of a predominantly male workforce may increase risks of GBV, Sexual Exploitation and Abuse (SEA), and social tensions, particularly in vulnerable communities.
- **Operational safety risks:** During operation, there is a risk of electrocution for both the public and maintenance workers if safety measures are not properly implemented.
- **Electromagnetic field (EMF) exposure:** Communities living near the transmission line may have concerns regarding exposure to electromagnetic fields, although levels are expected to remain within acceptable limits.
- **Temporary disruption of access and local infrastructure:** Construction activities may temporarily affect access to roads, farmland, and local services.
- **Visual and landscape impacts:** Transmission towers and lines will introduce visual changes to the landscape, particularly in open and rural areas.
- **Risk of water contamination** from construction activities near water bodies and wetlands.

The main legal and regulatory instruments governing the environmental management in Rwanda are quoted and an analysis of the legal and administrative framework related to resettlement and compensation measures are elaborated in the context of the Resettlement Action Plan.

The Government of Rwanda through REG-EDCL will be responsible for the payment of the compensations. It is the requirement of the national law on expropriation in public interest of 2015, ESF-ESS5 that no civil works for project implementation can begin if the compensations have not been provided for the affected community.

Risk Classification

As categorized in the Project ESMF and based on the impact assessment done, the environmental and Social risk rating of this project is substantial considering the anticipated risks and impacts associated with construction of this 110 kV transmission line.

Stakeholder Consultation

Consultations for the 110 kV transmission line project were conducted at national, district, and local levels from 27 July to 28 August 2025, including a meeting at Nyamabuye Sector, Gahogo Cell with 35 participants in Muhanga District and 73 participants in Ruhango District, representing men, women, and vulnerable groups. Facilitated by EDCL, district officials, local leaders, and the consultant team, the consultations allowed affected persons to voice concerns, ensuring their input is integrated into project design and strengthening the transparency, legitimacy, and acceptability of the resettlement process. The consultation will continue throughout the project implementation including the consultation that will be done during the RAP preparation which will be done after the final designs are approved.

Stakeholder consultations conducted for the Construction of the 110 kV Double Circuit Cut-in Cut-out Transmission Line Kigoma SS – Mt Kigali SS (21 km) highlighted several key environmental and social concerns. Affected communities and local authorities emphasized the implications of

land acquisition and resettlement, particularly the loss of land, houses, crops, and trees within the Right of Way. Concerns were also raised regarding potential impacts on livelihoods, especially for households dependent on agriculture, as well as temporary disturbances during construction such as noise, dust, restricted access, and safety risks. Additional issues included community health and safety, risks associated with labor influx (including communicable diseases and social tensions), and the need for fair and timely compensation in line with national laws and international standards.

Consultation with the International Union for Conservation of Nature (IUCN Rwanda) provided valuable technical input on biodiversity and wetland-related aspects of the project. IUCN highlighted the importance of strengthening the biodiversity baseline, even in modified agricultural landscapes, and recommended targeted assessment of avifauna, wetland-dependent species, and habitat sensitivity. Specific concerns included potential bird collision risks, ecological functions of agricultural wetlands such as Rugeramigozi and Gasenyi, and the need to apply the mitigation hierarchy (avoidance, minimization, restoration). Although IUCN noted that no bird migratory route is known in the area, it further advised incorporating practical measures such as appropriate line design (e.g., bird diverters where necessary), proportionate monitoring, and integration of biodiversity considerations into the ESMP to ensure alignment with good international practice.

Chapter I: Introduction

The Government of Rwanda (GoR), through the Ministry of Infrastructure (MININFRA), with financing from the World Bank (WB) and the Asian Infrastructure Investment Bank (AIIB), is implementing the Accelerating Sustainable and Clean Energy Access Transformation (ASCENT) Project. The ASCENT Project builds on the achievements of earlier programs, including the Electricity Access Rollout Program (EARP), which significantly increased national electricity access rates from 12% in 2012 to about 61% in 2023. The ASCENT Project aims to further support the Government's objective of achieving universal access to modern energy while improving the reliability and efficiency of electricity services.

The ASCENT Project is implemented under the broader framework of the Rwanda Universal Energy Access Program (RUEAP), which serves as a multi-donor program coordinating investments in the energy sector. For implementation purposes, the Government of Rwanda has established the RUEAP which is the Program Implementation Unit (PIU) within the Energy Development Corporation Limited (EDCL), a subsidiary of the Rwanda Energy Group (REG), to manage projects financed by different development partners.

Under Component 2: Enhancing the Efficiency of Electricity Services of the ASCENT Project, EDCL is implementing key transmission infrastructure investments aimed at improving grid stability and reliability. These include the construction of the 110 kV Double Circuit Cut-in Cut-out Transmission Line Kigoma SS – Mt Kigali SS (approximately 21 km), located in Muhanga and Ruhango Districts.

In accordance with Rwanda's environmental legislation, including the Law on Environment, Environmental and Social Impact Assessment (ESIA) is mandatory for major infrastructure projects prior to implementation. This report therefore presents the Environmental and Social Impact Assessment (ESIA) for the proposed transmission line under the ASCENT Project, financed by the World Bank and AIIB.

The overarching objective of the project is to reinforce the Rwanda transmission network and improve the rate of access to electricity supply for the people of Rwanda. The specific objective of this ESIA is to study the environmental and social impacts of the selected transmission lines.

The assessment of the project indicates that, across its phases (pre-construction, construction, operation, and decommissioning), the proposed transmission line is expected to generate several positive socio-economic impacts, particularly at local and national levels. These impacts are summarized thematically as follows:

- **Employment and income generation:** During the construction phase, the project will create temporary employment opportunities for local communities, including skilled and unskilled labor. This will provide short-term income and support local livelihoods. In addition, indirect employment opportunities may arise through demand for local goods and services.
- **Improved electricity access and reliability:** The transmission line will supply power to the Muhanga Substation and strengthen the existing network, thereby improving the

reliability and quality of electricity supply in Muhanga, Ruhango, and surrounding areas. This will reduce outages and support both households and businesses.

- **Economic development and productivity:** Improved electricity supply will facilitate the growth of small and medium enterprises, agro-processing, and local industries, contributing to increased productivity and economic diversification in the project area.
- **Local socio-economic development:** The project will stimulate local economic activities during construction (e.g., accommodation, transport, and food services), leading to increased income for nearby communities.
- **Capacity building and knowledge transfer:** Engagement of local workers alongside specialized contractors will contribute to skills transfer, particularly in construction, electrical works, and safety practices.
- **Gender inclusion opportunities:** The project provides an opportunity to promote gender inclusion by encouraging the participation of women in employment opportunities (where feasible), community engagement processes, and awareness programs, particularly through targeted measures in the ESMP.
- **Efficient use of energy resources:** By strengthening the transmission network, the project will contribute to a more efficient distribution of electricity, reducing technical losses and improving overall system performance.

The project will also have risks and negative impacts on the socio-economical and biophysical environment such as, conflicts among workers and the local population in the project area, destruction or disruption of infrastructure and socio-economic loss, traffic congestion, noise pollution, risk of increase of HIV/AIDS and other sexually transmitted diseases, construction accident/ injuries, loss of biodiversity, soil damage and erosion, changes of landscape - Visual impact and disposal, air dust/pollution, wastewater and solid waste generation, disturbance and destruction of the faunal habitat, occupational health and safety impacts, etc.

The potential environmental and social risks associated with the project will be mitigated through the implementation of appropriate measures integrated into the Environmental and Social Management Plan (ESMP), in line with national regulations and international standards. Key mitigation measures include:

- **Stakeholder engagement and conflict management:** Continuous consultation with local communities and establishment of a functional grievance redress mechanism to prevent and resolve conflicts between workers and communities.
- **Traffic and infrastructure management:** Implementation of traffic management measures and proper planning of construction activities to minimize congestion and disruption of local infrastructure.
- **Air quality and noise control:** Application of dust suppression measures (e.g., water sprinkling), regular maintenance of machinery, and restriction of noisy activities to daytime hours.
- **Public health measures:** Awareness campaigns on HIV/AIDS and other communicable diseases, enforcement of workers' codes of conduct, and collaboration with local health authorities.
- **Soil and erosion control:** Adoption of good construction practices, including controlled excavation, backfilling, and site rehabilitation to prevent soil erosion and land degradation.

- **Waste management:** Proper collection, segregation, storage, and disposal of solid and liquid wastes, including safe handling of hazardous materials such as oils and fuels.
- **Biodiversity and habitat protection:** Minimization of vegetation clearing, avoidance of sensitive areas where possible, and restoration of disturbed habitats after construction.
- **Occupational health and safety (OHS):** Provision of appropriate personal protective equipment (PPE), training of workers, and enforcement of safety procedures to reduce accidents and injuries.
- **Community health and safety:** Implementation of safety signage, restricted access to construction sites, and awareness programs to protect nearby communities.
- **Visual impact management:** Careful siting and alignment of infrastructure to reduce landscape intrusion where feasible.
- **Minimizing resettlement:** By avoiding densely populated areas

1.1 Context and Objectives of the Environmental and Social Impact Assessment

The Environmental and Social Impact Assessment (ESIA) for the proposed 110 kV double circuit cut-in cut-out transmission line Kigoma SS – Mt Kigali SS has been undertaken to identify, predict, and evaluate the potential environmental and social impacts associated with the project across its lifecycle, including pre-construction, construction, operation, and decommissioning phases. The ESIA aims to ensure that project design and implementation are environmentally sound and socially acceptable by proposing appropriate mitigation and enhancement measures. It further seeks to ensure compliance with Rwanda's environmental regulations and alignment with the World Bank Environmental and Social Framework (ESF) and the Asian Infrastructure Investment Bank (AIIB) requirements. The assessment also provides a basis for informed decision-making, stakeholder engagement, and the development of an Environmental and Social Management Plan (ESMP) to effectively manage identified risks and impacts.

The general objectives of the ESIA are:

- To identify potential environmental and social risks and impacts of the lines, both positive and negative;
- To draft an Environmental and Social Management Plan (ESMP) including risk and impact mitigation measures and an environmental monitoring program; and
- To estimate costs of mitigation measures.

1.1.1 Immediate Objectives of the ESIA

1. Improve the environmental and social design of the project
2. Ensure that resources are used appropriately and efficiently
3. Identify appropriate measures for mitigating the potential negative impacts of the project
4. Facilitate informed decision-making, including setting environmental and social terms and conditions for implementing the project

1.1.2 Long-Term Objectives of the ESIA

1. Protect human health and safety
2. Avoid irreversible changes and serious damage to the people and the environment

3. Safeguard valued resources, natural areas and ecosystem components
4. Enhance the social aspects of the project

1.1.3 Specific Objectives of the Study

1. To detect the effects of the project on the neighboring environment such as the water bodies, the soil, neighboring communities, the infrastructure, the fauna, the flora and possible atmospheric impacts.
2. To propose alternative measures where it is noticed that adverse effect may occur;
3. To propose mitigation measures where adverse effects may have occurred;
4. To carry out a diagnosis of the existing social and environment and activities in the area of the project;
5. To highlight the potential of the construction of 110 kV lines and substations with regard to social and environmental aspects;
6. To propose enhancement measures where beneficial effects from the project are detected;
7. To set up an environmental and social management plan that will govern all activities of the project for the better protection of the environment.

Through the Environmental and social Impact Assessment of this project, the focus was to identify the main environmental and social risks raised by the Transmission power lines & Sub-stations, construct and define the best ways of optimizing the projects from the environmental and social point of view by avoiding, minimizing or offsetting negative environmental impacts. As a first step, an Environmental and Social diagnosis was established after analysis of the current state of the various environmental and social aspects in close collaboration with the concerned stakeholders including local population affected, local authorities and NGOs. Secondly plans for the implementation and monitoring of measures limiting these negative risks and impacts of projects on the social and environment were prepared. Thirdly, detailed cost estimates of these measures before, during and after execution of the project were established.

This ESIA Report was prepared in compliance with the Environmental and Social requirements of the Government of Rwanda, as well as policies and procedures of the WB-ESF (see Chapter II: Policy, Legal and Institutional Framework).

1.2 Benefits of Access to Electric Power

Power being today a major drive of development, the increase of the rate of access to electric power will certainly contribute to the achievement of the Strategic Development Plans of the Countries as well as the Sustainable Development Goals (SDGs) as defined by the UN, particularly the SDG 7 aiming at ensuring access to affordable, reliable, sustainable and modern energy for all.

Indeed, power appears more and more to be a basic good without which true development is not possible. Thus, access to energy, and particularly electricity, is a major lever of development through its effects outlined below.

1.2.1 On Poverty and Hunger

Access to electric power allows for a longer working day thanks to access to light and time and money saved (easier access to energy and water). Moreover, the use of electric equipment for irrigation makes it possible to increase handicraft and agricultural productivity.

The availability of energy is also an economic development factor because it allows the development of small and medium enterprises as well as automation of processing activities for agricultural products and their conservation (refrigeration).

1.2.2 On Health

The availability of electricity in health centers allows the storage of medicines (refrigeration) and increased safety at night during delivery. In addition, access to communication means (TV, radio, Internet) facilitates transfer of knowledge on basic topics such as protection against HIV/AIDS and malaria as well as telemedicine. Access to electric light also decreases internal pollution due to cooking with wood and charcoal, candles, and kerosene lamps, which reduces risks of respiratory problems. Finally, access to electricity by improving living and working conditions of nurses and doctors will incite them to remain in villages.

1.2.3 On Education

Time saving thanks to energy and access to electric lighting makes it easier for pupils to study at night in good conditions. Availability of electricity allows for access to the Internet and tele-education, which thus increase access to knowledge. The availability of electricity also prompts teachers to remain in rural areas and not migrate to towns. Furthermore, access to electricity and water helps improve teaching conditions and the organization of night classes for adults.

1.2.4 On the Improvement of Living Conditions, Particularly for Women

Within the household, women often perform most of domestic tasks. Time saved thanks to access to electricity and the elongation of the duration of a working day thanks to electric light help women organize in a more flexible way their day and above all practice an income generating activity. Thus, they have enough personal income that ensures that they are more and more autonomous and have a better quality of life. In addition, access to media (TV, radio, Internet) helps to make progress in the image of women in the traditional societies.

1.2.5 On Decrease of Rural Exodus

The improvement of living conditions of rural households and local job creation thanks to economic development help reduce the need for rural exodus.

1.2.6 On Environment

Access to electricity reduces the need for biomass that is often overexploited. The use of hydropower energy also helps avoid production of greenhouse gases such as CO_2 coming from the combustion of wood and charcoal for heating and cooking.

1.2.7 Project Justification and Rationale

The proposed 110 kV Double Circuit Kigoma–Muhanga Transmission Line (21 km) is a strategic investment under the ASCENT Project aimed at strengthening grid reliability, improving power quality, and supporting Rwanda's transition toward universal electricity access. The project responds to increasing electricity demand in Muhanga and Ruhango District, driven by population growth, urban expansion, and productive economic activities, while addressing existing constraints in transmission capacity and network stability. By creating a cut-in/cut-out connection between Kigoma and Mt Kigali lines through the Muhanga Substation, the project enhances redundancy and reduces power outages, thereby improving service continuity for households, public institutions, and businesses. In addition, the project contributes to national development priorities by enabling economic growth, facilitating industrialization, and supporting social services such as health and education, while aligning with Rwanda's energy sector strategies and climate-resilient development goals. The selection of the route, largely through agricultural and built-up areas with limited ecological sensitivity, further supports the project's feasibility by minimizing environmental and social risks while maintaining technical and economic efficiency.

1.3 Methodological Approach

1.3.1 Desk Review

To ensure this level of compliance and to recognize internationally accepted best management practices, the desk review focused on the following:

- Overall biophysical environmental impact and constraints (with reference to soils and underlying geology, impact on flora and fauna populations);
- Overall impact on the surrounding environment due to surface structures, and associated infrastructure.
- Water and wastewater management.
- Hydrology and hydrogeology.
- Process emission (both gaseous and effluent) and air quality from the operations and potential effects, including dust.
- Method of waste disposal (solids, slurries, liquids) to minimize environmental impact; and
- Site rehabilitation.

1.3.2 Data Collection Methodology

In the framework of the environmental impact assessment, consultations were initiated in each district administration, and communities affected by the project. That approach was meant to collect complementary information, to gather comments and to know the concerns raised by the project with regard to the biophysical environment.

The Data collection was done using tablets to make the best use of the limited time available and to check the data collected every day. The 2 days training sessions also gave the survey team an opportunity to assess the quality of questionnaires and covered the following activities:

(i) Familiarize all surveyors with all questions in questionnaire, including their purpose, range of potential answers, how to prompt if needed, sensitiveness of the questions if any, and so on;
(ii) Accustom all surveyors with the use of tablets and SurveyCTO software along data collection;
(iii) Test the surveyors for their learning ability, knowledge, interviewing skills, and so on;
(iv) Decide how to resolve confusing issues related to interviewing, when and how to prompt.

A trainer was at the same time in charge of electronic data management, processing and analysis. The training exercise consisted of reviewing all questions in the questionnaire one by one, explaining the intent of them, their possible responses and how the questions should be asked. Surveyors were trained through interactive presentation exercises, group assignments, mock interviews and role play, and at the end, given tests to demonstrate their level of understanding of the questionnaire.

This exercise served a dual purpose, as surveyors were at the same time being trained to understand the questionnaire but also to be able to apply data collection using electronic devices-tablets using the SurveyCTO Collect application.

To abide with time constraint, four teams were deployed concurrently on four sites while one team remained in the office for data entry and report narrative activities. Each team had the following members:

- One experienced ESIA expert as team coordinator.
- One experienced topographic surveyor
- Another environmentalist to oversee all site environmental issues
- One enumerator

Consultations were carried out at two levels:

- At the central level, that consultation involved resource persons with an expertise in one or the other area tackled by the study (land, forestry, environment, quarries, and mines, water resource management, etc.);
- At the decentralized level, local administrative authorities were consulted from the provincial level, districts up to the sectors, particularly those from regions that will be affected by the project.

The interview method was used during consultation with experts from different institutions at the central level, as well as with local authorities from provinces, districts and sectors. An introductory letter to the different authorities was thus prepared EDCL and was given to the team of consultants working on the ESIA. That letter requested the authorities to facilitate the work and to provide the information needed by the visiting consultants. Before consultation, an appointment was first of all requested with each given authority or expert, and during the interview, we would present the copy of the introductory letter as well as an information leaflet that would give a brief introduction of the power transmission lines project (lists of consulted persons in Appendices 2 and 3).

The purpose for that public consultation is summarized through the following:

- To gather new environmental information in the study area.

- To inform authorities and experts about the project and particularly those from institutions with an interest in the project due to their areas of competence or responsibility.
- To know the concerns on environmental components that will be affected and proposal for potential mitigation measures.
- To discuss synergies and possibilities of integration of the project into other projects underway or being planned, or to identify possible duplication with the latter.
- To identify ways of cooperation with the various institutions at different phases of the project implementation.

The biodiversity assessment integrated field surveys conducted during different seasons like: Long Dry Season (June – September): done in August 2025. Short Rainy Season (October – mid-December): done in December 2025. Short Dry Season (mid-December – February): Done in February 2026, and was complemented by literature review and ecological knowledge of the area to account for seasonal variability. Given the highly modified nature of the project area, dominated by agriculture and degraded wetlands, no significant differences in terrestrial biodiversity composition are expected between wet and dry seasons. Seasonal variation is mainly limited to temporary increases in amphibian activity and waterbird presence during the rainy season. No sensitive habitats or threatened species were identified in either seasonal context.

1.3.3 Impact and Risk Assessment Methodology

The methodology used for impact assessments in this report relates to risk assessment (whereby certain impacts to the environment are identified), risk evaluation (by using a stipulated assessment criteria whereby impacts are given a rating or weighting and obtaining an overall rating or significance of an impact) and risk management (relating directly to applicable mitigation measures to be implemented to manage a risk of an impact in the best interest of society; Shogren, 1990). The guideline criteria followed in this study are presented in the table below.

Table 1: Assessing criteria and ratings used for determining impact significance

Nature or Status of the Impact: The type of effect the activity would have on the environment		
Status		**Description**
Positive:		A benefit to the holistic environment
Negative:		A cost to the holistic environment
Neutral:		No cost or benefit
Duration of the Impact: The lifetime of the impact		
Score	**Duration**	**Description**
1	Short term	Less than 2 years
2	Short to medium term	2 – 5 years
3	Medium term	6 – 25 years

Nature or Status of the Impact: The type of effect the activity would have on the environment		
4	Long term	26 – 45 years
5	Permanent	46 years or more
Extent or Scale of the Impact: The distance from source that impacts may be experienced		
Score	**Extent**	**Description**
1	Site specific	Within the site boundary
2	Local	Affects immediate surrounding areas
3	Regional	Extends substantially beyond the site boundary
4	National	Affects country
Reversibility of the Impact: To what degree its influence on the relevant environment can be negated.		
Score	**Reversibility**	**Description**
1	Completely reversible	Reverses with minimal rehabilitation & negligible residual affects
3	Reversible	Requires mitigation and rehabilitation to ensure reversibility
5	Irreversible	Cannot be rehabilitated completely/rehabilitation not viable
Intensity or Magnitude of the Impact: Severity of the negative and magnitude of positive impacts		
Score	**Severe/beneficial effect**	**Description**
1	Low	Little effect - negligible disturbance/benefit
2	Low to moderate	Effects observable - environmental impacts reversible with time
3	Moderate	Effects observable - impacts reversible with rehabilitation
4	Moderate to high	Extensive effects - irreversible alteration to the environment
5	High	Extensive permanent effects with irreversible alteration
The Probability of the Impact: Describes the likelihood of the impact actually occurring		
Score	**Rating**	**Description**
1	Unlikely	Less than 15% sure of an impact occurring
2	Possible	Between 15% and 40% sure of an impact occurring
3	Probable	Between 40% and 60% sure that the impact will occur

Nature or Status of the Impact: The type of effect the activity would have on the environment		
4	Highly Probable	Between 60% and 85% sure that the impact will occur
5	Definite	Over 85% sure that the impact will occur
The Consequence (C)		= Magnitude/Intensity (M/I) + Extent (E) + Duration (D) + Reversibility (R).
The Significance (S)		= Consequence (C) x Probability (P)

1.3.4 Determination of Significance

After assessment of an impact in accordance with the criteria described above, the significance of an impact can be determined. The various ratings as indicated above are accorded to these criteria. These ratings are then used to calculate a significance (S) rating and are formulated by adding the sum of ratings given to the extent (E), duration (D), Reversibility (R) and intensity (I) and then multiplying the sum by the probability (P) of the impact, as follows: S = (E + D + R + I) × P.

The significance rating is described as follows:

Table 2: Significance rating table

Score out of 100	Significance
1 to 20	**Low**
21 to 39	Low to Moderate
40 to 60	Moderate
61 to 79	Moderate to high
80 to 100	High

Chapter II: Policy, Legal and Institutional Framework

Rwanda has a very comprehensive legal and institutional framework in relation to environmental protection, starting from the National Constitution, as well as specific laws on matters pertaining to environment or Natural Resource Protection.

2.1 Strategies and Policies

2.1.1 The National Strategy for Transformation (NST2)

The development landscape in Rwanda has changed considerably since the adoption of the Vision 2020 in the year 2000. The progress made in less than two decades has given Rwandans much hope and belief to aspire for greater achievements. Before the Vision 2020 has come to term, Rwanda embarked in 2017 on the reflection and elaboration of a Vision 2050, which aspires to take Rwanda to high living standards by the middle of the 21st century and high quality livelihoods. The implementation instrument for the remainder of Vision 2020 and for the first four years of Vision 2050 were the National Strategy for Transformation (NST1). NST1 provided the foundation and vehicle towards Vision 2050.

The National Strategy for Transformation (NST2), which is the five-Year Government Programme (5YGP), comes at a unique moment in the country's development trajectory and serves as the continuity of the NST1. This strategy is expected to lay the foundations for decades of sustained growth and transformation that will accelerate the move towards achieving high standards of living for all Rwandans.

The NST 2 will pick up from where NST1 left off, and continue in an effort to accelerate the transformation and economic growth with the private sector at the helm. With this new strategy, Rwanda's public policy will focus on developing and transforming Rwandans into a capable and skilled people ready to compete in a global environment.

2.1.2 The National Environment and Climate Change Policy (MoE, 2019)

Vision 2050 aspires to take Rwanda beyond high income to high living standards by the middle of the 21st century. To realize our full potential and drive towards this goal, Rwanda is committed to being a nation that has a clean and healthy environment that is resilient to climate variability and change and that supports a high quality of life for its citizens. This Environment and Climate Change Policy reaffirms the government's commitment to address climate change and its resolve to lessen the potential hardships that climate change may pose to the sustainable development of the country. The policy, therefore, seeks to provide strategic direction on environment and climate change in Rwanda, bearing in mind its linkages with the country's socio-economic development.

The National Environment and Climate Change Policy provides strategic direction and responses to the emerging issues and critical challenges in environmental management and climate change adaptation and mitigation. The key issues and challenges identified include high population density, water, air and soil pollution, land degradation, fossil-fuel dependency, high- carbon transport systems, irrational exploitation of natural ecosystems, lack of low-carbon materials for

housing and green infrastructure development, inadequate waste treatment for both solid and liquid waste, increase of electronic, hazardous chemicals and materials waste, among others.

The policy is designed within the context of national, regional and global development commitments (e.g. Vision 2050 aspirations, National Strategy for Transformation (NST1), Green Growth and Climate Resilience Strategy (GGCRS), Nationally Determined Contributions (NDCs), Sustainable Development Goals (SDGs), Agenda 2063, East African Community - EAC Vision 2050, etc. It also provides a policy framework to tap into opportunities of a green growth led and climate resilient economy. This Policy was developed through a consultative process involving all stakeholders. Consultations with actors at national and district levels, development partners, the private sector and CSOs informed the development of policy objectives and proposed policy actions.

The policy goal is for "Rwanda to have a clean and healthy environment resilient to climate variability and change that supports a high quality of life for its society." The seven objectives of the policy are (1) Greening economic transformation; (2) Enhancing functional natural ecosystems and managing biosafety; (3) Strengthening meteorological and early warning services (4) Promoting climate change adaptation, mitigation and response; (5) Improving environmental well-being for Rwandans; (6) Strengthening environment and climate change governance; and (7) Promoting green foreign and domestic direct investment and other capital inflows. To implement these policies, 22 policy statements and 127 policy actions have been identified.

It is evident that energy component, particularly production and promotion of clean energy and make it accessible to the citizens is central to this policy, especially implicitly implied in strategic objective (1) Greening economic transformation; and (4) Promoting climate change adaptation, mitigation and response.

Key relevant action points are:

- Promote resource efficiency technologies to reduce energy consumption in processing industries.
- Promote renewable energy to achieve universal access to electricity.
- The ESIA is a key instrument to ensure environment sustainability and hence an element toward realization of the policy's goals and objectives.

2.1.3 The Green Growth and Climate Resilience Strategy / National Strategy for Climate Change and Low Carbon Development (2011)

This strategy is one of the initial steps on a pathway which leads to a sustainable, secure future where Rwanda is prepared for the risks associated with climate change, population growth and rising oil prices. The 'National Strategy for Climate Change and Low Carbon Development' aims to build upon work that is already being done in Rwanda on climate change, focusing the various projects and policies into a holistic national document which encompasses long-term direction and short-term actions.

The focus thus far has been on adaptation as Rwanda is highly vulnerable to climate change due to its dependence on rain-fed agriculture. However the focus is shifting to climate resilience and low carbon development which addresses both adaptation and mitigation, whilst focusing on

sustainable economic growth and poverty reduction. Rwanda has the opportunity to leapfrog old technologies and destructive development pathways, and build a green economy, resilient to oil prices spikes and a changing climate.

This Strategy however, looks beyond 2020 to 2050, and recommends actions that Rwanda can take in the short to medium term to ensure its future stability and prosperity in a changing climate and uncertain energy future

The purpose of the Strategy is threefold:

- To guide national policy and planning in an integrated way;
- To mainstream climate change into all sectors of the economy; and
- To position Rwanda to access international funding to achieve climate resilience and low carbon development.

By strengthening the electricity transmission network and improving the reliability of power supply, the project supports the transition to cleaner energy use and reduces reliance on high-emission energy sources such as biomass. In addition, the project design and ESIA process integrate climate resilience considerations, such as avoiding environmentally sensitive areas and addressing erosion and land degradation risks, thereby aligning with the strategy's objectives of sustainable resource management and climate adaptation

2.1.4 The National Biodiversity Strategy and Action Plan (NBSAP 2025–2030)

The National Biodiversity Strategy and Action Plan (NBSAP 2025–2030) provides Rwanda's strategic framework for the conservation, sustainable use, and restoration of biodiversity in line with global commitments under the Convention on Biological Diversity (CBD). The strategy emphasizes the protection of ecosystems, including wetlands, forests, and agro-ecosystems, while promoting the integration of biodiversity considerations into sectoral planning such as energy, agriculture, and infrastructure development. It prioritizes actions such as strengthening biodiversity data and monitoring systems, conserving critical and degraded habitats, safeguarding threatened species, promoting ecosystem restoration, and enhancing community participation in biodiversity management. The NBSAP also highlights the importance of applying the mitigation hierarchy (avoid, minimize, restore, offset) in development projects and improving institutional coordination and capacity for biodiversity management.

In addition, the strategy recognizes increasing pressures on biodiversity from infrastructure expansion, land use change, and climate change, and therefore calls for rigorous Environmental and Social Impact Assessments (ESIAs), biodiversity-sensitive planning, and long-term monitoring of impacts. Particular attention is given to wetlands and modified landscapes, which continue to provide essential ecosystem services despite human use. The NBSAP further encourages the adoption of nature-based solutions, sustainable land management practices, and integration of biodiversity considerations into national development priorities to ensure ecological integrity and resilience.

The NBSAP (2025–2030) is directly relevant to the Construction of the 110 kV Double Circuit Cut-in Cut-out Transmission Line Kigoma SS – Mt Kigali SS (21 km) project as it requires infrastructure developments to integrate biodiversity conservation into the planning and

implementation. The project's ESIA aligns with the NBSAP by identifying potential impacts on vegetation, wetlands, and fauna, and by proposing mitigation measures such as minimizing vegetation clearing, protecting wetland functions, and addressing risks to species such as birds. The project also supports the strategy's objectives by applying the mitigation hierarchy and incorporating biodiversity considerations into the ESMP, thereby contributing to sustainable infrastructure development while safeguarding ecosystem integrity.

2.1.5 The National Forest Policy (2015)

The National Forest Policy is concerned with issues related to forests, but also to ecological and economic safety of trees, bush research, forestry under any form and capacity building. The purpose of that policy consists in making forestry one of the pillars of the national economy and ecological viability.

The sector will significantly contribute to the household income, improvement of human and animal feeding, significant reduction of soil erosion and improvement of farmland fertility. To materialize that vision, forest coverage is expected to reach at least 30 % of the national territory and agroforestry will be practiced on at least 85 % of family farm holdings.

The National Forest Policy is focused, among others, on the following elements:

- To increase and diversify forest resources;
- To organize tree belts around natural forests;
- To classify mountains tops and slopes with steep terrain as forest land and to protect them;
- To prohibit wood use in brick making factories, tile kilns, charcoal factories, and scaffolds
- To rehabilitate degraded forests and woodlands;
- To manage and protect natural forests;
- To introduce and strengthen the functioning of District Forest Funds and their capacity in terms of forest management.

The ESIA will assess how the forests and individual trees could be affected during project implementation, through clearing the right of way and mitigation measures developed to minimize the impacts. Adequate compensation will be implemented accordingly.

2.1.6 The National Wetlands Management Policy (2015)

Swamps are included in State land. They are a part of wetlands and include among others:

- Marshes and wetlands;
- Permanent lakes, rivers, water, watercourses, and brooks;
- Intermittent and regular lakes, rivers, watercourses and seasonal, brooks, including flooding plains;
- Pools, swamps and peat bog;
- Irrigated lands, including irrigation channels and rice fields;
- Seasonal flooded agricultural land;

- Water storage areas including reservoirs and dams. Their use is notably submitted to the following conditions:
- To have prior authorization from the Minister in charge of environment or his/her delegate before undertaking marshes and other wetland use and development project;
- To have prior authorization to introduce, import or export any animal or plant species in wetlands;
- Prohibition to plant or introduce wetlands species that are likely to undermine the environment, especially those derived from modified living organisms;
- Prohibition to practice fishing and hunting activities in wetlands without a written authorization;
- Prohibition to plant eucalyptus and banana trees in wetlands except for environment protection purposes;
- Prohibition to construct residences in wetlands;
- Prohibition to set up marketplaces, industries or factories, dumpsites, slaughterhouses, fuel or washing stations, garages, cemeteries or any other building likely to degrade those areas;
- Prohibition to drop any sort of waste and discharge waste that is potentially harmful for environment and health in wetlands.
- Sanctions are also provided for the ones who:
- Clears or drains a wetland without a written authorization;
- Erects, constructs, places, alters, displaces or destroys any structure that is in, under or on a wetland;
- Disturbs a wetland by practicing boring or by excavating a tunnel in a way that is likely to have negative effects on a wetland;
- Destroys, damages or disturbs any wetland in a way that is likely to have negative effects on plants, animals or their habitats;
- Introduces any exotic plant or animal species that is likely to harm wetlands;
- Draws the soil from the wetland or practices bushfire in the wetland;
- Omits, neglects or refuses to protect shores against environmental degradation;
- Pursues an activity subject to suspension or prohibition.

Those who do not comply with the above-mentioned rules may be subject to the obligation of carrying out works intended to rehabilitate the degraded wetlands. The ESIA will identify the areas and extent of impacts on wetlands to be addressed through the ESMP, and the wetland assessment is presented in Chapter IV of this ESIA.

2.1.7 The Rwanda Energy Policy (2015)

The purpose of the Energy Policy is to respond to the Rwandan population's energy challenges and needs for economic and social development within a viable and sustainable environmental framework. More specifically, the Energy Policy aims at:

- Making available affordable and sufficient energy supply throughout all the country;
- Reforming the energy service market and establishing an adequate institutional framework that will facilitate investments, service expansion, efficient pricing mechanisms and incentive measures from a financial point of view;

- Strengthening the development and use of renewable and local energy sources and technologies.
- Appropriately taking into account environmental considerations in all energy activities;
- Increasing energy efficiency and conservation in all sectors.
- Increasing education in the energy area and building gender balance in planning, implementation and monitoring of the energy sector.

The project aims at the realization of this policy's objectives.

2.1.8 The Energy Sector Strategic Plan (2024/2025 – 2029/2030)

Energy remains a cornerstone of Rwanda's economic transformation and development agenda, supporting key sectors such as industry, agriculture, urbanization, mining, tourism, and digital services. A reliable, efficient, and sustainable energy sector is therefore essential for achieving the country's long-term development goals. The Energy Sector Strategic Plan (ESSP 2024/2025–2029/2030) provides a comprehensive framework for guiding investments and interventions in the sector, building on the achievements and lessons learned from previous strategies.

The ESSP 2024/2025–2029/2030 is aligned with the National Strategy for Transformation (NST2) and the National Energy Policy, translating policy priorities into actionable programs and measurable targets. The strategy focuses on expanding access to modern energy, improving the quality and reliability of electricity supply, strengthening transmission and distribution infrastructure, reducing system losses, and promoting clean and efficient energy use. It also emphasizes financial sustainability of the energy sector, increased private sector participation, and climate-resilient energy systems.

Key strategic priorities under the ESSP include:

- Achieving and sustaining **universal access to electricity** for households, enterprises, and public institutions;
- **Improving reliability and quality of electricity supply**, including reducing outages and voltage fluctuations;
- **Strengthening transmission and distribution networks** to support growing demand and ensure grid stability;
- **Reducing technical and commercial losses** across the electricity network;
- Promoting **clean cooking solutions** and reducing dependence on traditional biomass;
- Enhancing **institutional capacity and sector efficiency**;
- Integrating **climate resilience and low-carbon development** into energy planning and infrastructure.

The proposed Construction of the 110 kV Double Circuit Cut-in Cut-out Transmission Line Kigoma SS – Mt Kigali SS (21 km) project directly contributes to the implementation of this strategy by strengthening the transmission network, improving grid reliability, and enabling efficient power distribution. By enhancing electricity supply in Muhanga, Ruhango, and surrounding areas, the project supports increased access to reliable energy for households and productive users, thereby contributing to economic development and improved service delivery in line with the ESSP objectives.

2.1.9 The Rwanda Rural Electrification Strategy (2016)

The Government of Rwanda recognizes the vital role that electricity access plays in accelerating economic development through improving health and standards of living. Energy and particularly access to electricity is the Government's key priority. This is why significant investments have been made and progress registered led to over 78.9% of households getting access to electricity. More efforts need to be made for the Government to achieve the set target of 100% by 2029.

For the above targets to be met, a combination of solutions that focus on the location, income and consumption level is required instead of the traditional connection to the grid that may not be suitable for all households. The most cost effective means for increasing access to electricity is through the use of off grid solutions that have wide range of technologies such as a basic solar lantern that can charge a phone or radio to a solar home system.

The Government developed this strategy with the objective of ensuring that Rwanda's households have access to electricity through the most cost effective means by developing programmes that will facilitate both the end users to access less costly technologies and increase private sector participation in the provision of these solutions. The four distinct programmes in the strategy include the provision of basic solar systems as a basic necessity to the less privileged population under Ubudehe category one, the establishment of a risk mitigation facility that will support the private sector, mechanisms that will increase, the development of mini-grids in suitable locations and the continued rollout of the Electricity Access Rollout Programme (EARP). The Government will work with the private sector in implementing this Strategy. Particular focus will be on increasing competition within private sector which will lead to reduced costs and improved choice of technologies on the market.

The Rural Electrification Strategy can be considered as 3 distinct programmes:

- Government to establish a mechanism to allow low-income households to access modern energy services through a basic solar system as a basic necessity.
- Government to establish a risk-mitigation facility targeting the private sector such that solar products will be made available on financial terms that the population can afford.
- Mini-grids to be developed by the private sector with Government playing a key role in identifying sites and establishing a framework through which these can become financially viable investments.

The project aims at the realization of this Strategy's objectives.

2.2 Legislation

2.2.1 Constitution of the Republic of Rwanda

The Constitution was adopted by Rwandans during the Referendum of 26 May 2003 and revised in 2023. It provides that clean and healthy environment is a right to everyone (Art 22). However, the Article 53 of the same Constitution stipulates that everyone has the duty to protect, safeguard and promote the environment; the State ensures the protection of the environment; and a specific law determines modalities for protecting, conserving and promoting the environment.

Regarding the right to property, the Constitution of Rwanda is very clear:

Article 34 on right to private property, stipulates that everyone has the right to private property, whether individually or collectively owned; private property, whether owned individually or collectively, is inviolable. The right to property shall not be encroached upon except in public interest and in accordance with the provisions of the law. Article 35 relates to the right to private ownership of land and says: "Private ownership of land and other rights related to land are granted by the State. A law determines modalities of concession, transfer and use of land". And the Article 44 on the Respect for State property says that everyone has a duty to respect State property. State property is composed of public and private property of the State, as well as the public and private property of decentralized Government entities and public institutions with legal personality; Public State property is inalienable unless there has been prior transfer thereof to the private State property in accordance with the law; Any act intended to damage, destroy, embezzle and squander State property is punished by law.

Finally, the National Constitution of Rwanda prohibits to make international agreements permitting the transit or dumping, on national territory, of toxic waste and other hazardous materials likely to cause serious damage to public health and the environment (Art. 169).

The present ESIA study is in line with the provisions of the Rwanda Constitution and the ESMP contains specifically detailed measures to take care of these provisions during all the project's implementation phases.

2.2.2 Law on Environment (N°48/2018 of 13/08/2018)

The Law on Environment defines Environment as: a diversity of things made up of natural and built environment, including chemical substances, biodiversity as well as socio-economic activities, cultural, aesthetic and scientific.

The law defines also key principles on which the environmental protection is based on, and including: Precautionary principle (Art 3); Principle of environmental sustainability (Art 4); Polluter pays principle (Art 5); Principle of information dissemination and incentives for environmental conservation (Art 6); and Principle of cooperation (Art 7).

The Law provides for the use, management and protection of key environmental resources such as: soil and subsoil resources (Art 10); water resources (Art 11 & 12).

Under the Chapter IV on the conservation and protection of built environment, the law provides for the management of different types of wastes, including: liquid waste (Art 17); solid waste (Art 18); hazardous and toxic waste (Art 19); and electronic waste (Art 20).

Chapter V of this law provides for obligations of the state, decentralized entities and local communities with regard to the protection, conservation and promotion of environment.

Regarding the procedures related to environmental management, Art 30 specifies that a Ministerial Order establishes the list of projects that must undergo Environmental Impact Assessment (ESIA) and defines also its process and procedures and delivery of authorization before project implementation. Similarly for the list of policies and programs that must undergo Strategic Environmental Assessment (SEA) (Art 31). Art. 32 stipulates that every project that may have significant impact on the environment must undergo an environmental audit (EA) during and after its implementation. The list of projects that must undergo environmental audit is established by an

Order of the Minister. An Order of the Minister also issues instructions and procedures for conducting environmental audit.

On the approval of the ESIA, SEA, EA, the Art 33 states that these assessments must be approved by the Authority, or another State organ authorized in writing to do so by the Authority. If the approval is made by an authorized organ, such an organ does so on behalf of the Authority which is also responsible for its audit.

The law establishes also the list of prohibited acts:

- In wetlands and Protected Areas (Art 42);
- Related to emissions of harmful noise (Art 43);
- In protection of biodiversity (Art 44);
- In relation to chemicals and waste (Art 45)

Similarly, the law also spells out administrative sanctions in relation to:

- Implementing a project without environmental impact assessment clearance (Art 46);
- Violation of required distances (Art 49)
- Polluting public and private area (Art 50);
- Polluting public or private area by human wastes (Art 51);
- Burning waste (Art 52);
- Causing noise pollution (Art 53)
- Importing, immersing, burying, burning of waste or using any other means that cause their decomposition (Art 57);
- Hunting, selling, injuring or killing a protected animal species (Art 58);

Finally, Chapter VII establishes measures for inspection and criminal investigation power in environmental matters. Art 61 defines staff with inspection capacity:

- Staff of the Authority;
- Staff of the City of Kigali and those of the district.

The Authority puts in place instructions governing inspection process. Article 62 establishes the powers of the inspectors as following:

- to inspect installations, factories, stores, shops and retail outlets, construction, houses, machines, vehicles, devices and products;
- to inspect records relating to the operations of the factory; to take a sample of elements suspected of degrading environment, measure, take and conduct a required research;
- to provisionally suspend or ban activities or materials considered to degrade the environment;
- to impose an administrative fine provided for under this Law

Article 63 stipulates that an Order of the Minister in charge of Justice grants some of staff members of the Authority the power of criminal investigation in environmental matters.

The ESIA process responds to obligations under this law and will ensure that the key principles, as well as the relevant provisions of this law are fully complied with.

2.2.3 Law Governing Land in Rwanda (N° 27/2021 of 10/06/2021)

The Art 1 of this law defines its purpose:

This Law determines modalities of allocating, acquisition, transfer, use and management of land in Rwanda. It also establishes the principles applicable to rights recognised over all lands situated on Rwanda's national territory and all rights united or incorporated with land, whether naturally or artificially.

Art 3 of this law specifies that land as common heritage:

The land is part of the common heritage of all the Rwandan people: the ancestors, present and future generations. Notwithstanding the recognised rights of people, only the State has the supreme power of management of all land situated on the national territory, which it exercises in the general interest of all with a view to ensuring rational economic and social development as defined by law. Therefore, the State is the sole authority to accord rights of occupation and use of land. It also has the right to order expropriation in the public interest.

Under this law, the expropriation is defined as: an act of taking away individuals' land by the State due to public interest in circumstances and procedures provided by law and subject to fair and prior compensation;

Art. 14 defines the State land in the private domain which consist of all the land that is not included in State land reserved for public activities or infrastructures and land that does not belong to public institutions or local authorities or individuals. That land shall be comprised of the following:

- vacant lands;
- escheat lands;
- confiscated lands in respect of the provisions of this Law;
- State land previously occupied by public activities removed from public domain in accordance with the laws;
- land acquired by the State through purchase, donation or expropriation for public interests;
- unprotected swamps;
- land occupied by State owned forests;
- land resulting from non-renewed lease issued to foreigner as provided by this Law;
- Land reserved for specific cemeteries.

Similarly, land in public domain of public institutions (Art 16) consists of land reserved for public para-statal institutions activities and infrastructures. Land in private domain of public institutions shall consist of the following categories:

- land not reserved for public activities use by public institutions;
- public institutions land previously used for public activities but which was removed from public domain in accordance with the law;
- land acquired by public institutions through purchase, donation or expropriation for public interests;
- Land occupied by public institutions forests.

The transfer of land from the public domain of public institutions to their private domain shall be done by an Order of the Minister in charge of land on proposal by the supervising Authority.

Regarding the enjoyment of full rights, Art 34 states that: the landowner shall enjoy full rights to exploit his/her land in accordance with the provisions of this Law and other laws. The State recognizes the right to freely own land and shall protect the landowner from being dispossessed of the land whether totally or partially, except in case of expropriation due to public interest.

The ESIA will provide an avenue for compliance with this law, while its provisions are to be addressed through the Compensation scheme and RAP.

2.2.4 Law Determining the Management and Utilization of Forests in Rwanda (N°47bis/2013 of 28/06/2013)

The law distinguishes state and private forests. Art 5 lists the following categories as states forests:

- protected forests;
- production forests;
- Forests reserved for research.

In order to improve forest management, the law provides for issuance of Licence (Art 48). However, Art 49 stipulates that the contents of each license provided for by this Law, its period of validity and conditions for its issuance shall be determined by an Order of the Minister. A special License for clearing the whole or part of a forest so that the land it covers is used for other purposes shall be issued by the Minister (Art 52).

The ESIA will comply with this law by identifying forests requiring Minister's license for clearing for purpose of right of way for power lines.

2.2.5 Ministerial Order No 006/MINIRENA/2015 of 18/06/2015 Determining the Management of Protected State Forests Not Governed by Special Laws

This order was issued pursuant to Law nº 47bis/2013 (the Law determining the Management and Utilisation of Forests in Rwanda), specifically Article 34, which mandates a Ministerial Order to manage state forests not covered by specific statutes.

Article 2 stipulates that the protected forests governed by this Order are any natural forest not governed by special laws and any forest planted alongside streams, rivers and lakes.

Article 4 clarifies that no activity shall be allowed in a natural forest except the activity authorized by the Minister in charge of forests.

Based on field verification conducted along the proposed transmission line corridor, no protected state forests or legally designated protected areas will be traversed by the project. Therefore, the Ministerial Order No. 006/MINIRENA/2015 is not directly triggered. However, the Order remains relevant as a guiding framework for good environmental management practices, particularly in relation to the protection of tree cover and prevention of unnecessary vegetation loss. The project will ensure that vegetation clearing is minimized within the Right of Way and that any disturbance to forest resources outside protected areas is managed in accordance with national regulations and sustainable environmental practices.

2.2.6 Ministerial Order No 008/MINIRENA/2015 of 18/06/2015 Establishing a List of Protected Trees

This Order establishes a list of protected trees in a State, District or a private forest and isolated species of trees.

Article 2 states that the list of protected trees shall be composed of trees that should not be cleared due to one (1) of the following reasons:

1° being a disappearing tree species;

2° being trees that are rarely found in a few parts of the world, endemic trees of Albertine rift and rare trees endemic of Rwanda.

3° being a medicinal tree;

4° being trees used in the development activities and which takes above twenty (20) years to reach the harvesting maturity;

5° being cultural related trees;

6° being a tree protected at the international level;

7° any other reason that may be determined.

The Ministerial Order is directly relevant to the Kigoma–Muhanga transmission line project, as vegetation clearing will be required within the Right of Way for construction and operation of the line. During this process, there is a possibility that some protected tree species may be encountered. The project will therefore ensure that a tree inventory is conducted prior to clearing, and that any protected species identified are managed in compliance with the Order. This includes obtaining the necessary authorizations before removal, minimizing unnecessary cutting, and implementing compensatory planting or restoration measures where applicable. Compliance with this Order will ensure that impacts on protected tree species are properly mitigated in line with national environmental requirements.

2.2.7 Law Governing Biodiversity in Rwanda (N° 70/2013 of 02/09/2013)

The purpose of this Law is to determine modalities for management and conservation of biological diversity within Rwanda (Art 1).

Under this Law, Art 14 stipulates that an Order of the Minister shall set out a national list of ecosystems that are threatened and in need of protection and their location, which shall refer to:

- critically endangered ecosystems;
- endangered ecosystems;
- vulnerable ecosystems;
- Other ecosystems with high conservation value or of high national importance.

Further to this article, an Order of the Minister shall also set out a list of activities prohibited in an ecosystem included on the list of ecosystems in need of protection (Art 15).

Similarly, Art 16 states equally that an Order of the Minister shall set out a list of the species in need of protection, in accordance with the following categories:

- critically endangered species ;
- endangered species;
- vulnerable species;
- Other species of such high conservation value or national importance that require protection, although they are not included in the categories of critically endangered, endangered or vulnerable species.

Art 17 specifies that activities involving species or specimens included on the list of endangered or protected species are prohibited, unless authorized by the Minister. The ESIA will determine sensitive and protected ecosystems to be affected by the project, and devise alternative or mitigation measures.

2.2.8 Ministerial Order Establishing the List of Protected Animals and Plants Species in Rwanda (No. 007/2008 of 15/08/2008)

According to this Ministerial Order, the species of protected animals are classified into: Mammals, birds, and reptiles (Art 1) and are listed in Appendix I of this Ministerial Order. These animals should not be hunted except when there is prior authorization from competent authorities (Art 2). This list comprises:

Annex 1: - Mammals: 18 species

- Birds: 15 species
- Reptiles: 4 species

Art 4: The list of protected plants is found in appendix II. The plants mentioned in appendix II should not be uprooted or cut without prior authorization from competent authorities.

This **Ministerial Order** is directly relevant to the proposed transmission line project as it provides the legal framework for the protection of designated fauna and flora species. In compliance with this Order, a biodiversity assessment was conducted through field surveys and literature review to identify the presence of any protected species within the project corridor and its area of influence. The findings confirm that the project area—characterized by agricultural landscapes and degraded wetlands—does not host any species listed under Appendix I (protected animals) or Appendix II (protected plants) of the Ministerial Order. Observed fauna mainly consist of common and widespread species classified as Least Concern, while vegetation is dominated by crops and non-protected tree species such as eucalyptus and grevillea.

Furthermore, the project design has avoided ecologically sensitive areas, and no critical habitats were identified along the route. Nevertheless, in line with Articles 2 and 4 of the Ministerial Order, the project will implement precautionary measures to ensure that no protected species are inadvertently affected during construction and operation. These measures include restricting vegetation clearing to the defined Right of Way, prohibiting hunting or disturbance of wildlife by workers, and implementing biodiversity monitoring as part of the Environmental and Social Management Plan (ESMP).

2.2.9 Ministerial Order No 003/MoE/25 of 19/08/2025 Relating to Environmental and Social Impact Assessment

The Ministerial Order defines environmental impact assessment as: systematic process of identifying environmental, social and economic impacts of a project, before a decision of its acceptance is made,

Art 3 and 4 specifies respectively the works, activities and projects that must undergo a full environmental and social impact assessment (listed on Annex I) and those that must undergo a partial environmental and social impact assessment (listed on Annex II). Construction of hydro-dams, hydropower plants and electrical lines of high and medium voltage; are among the works / activities listed in Annex I among activities that must undergo a full ESIA.

The developer, whose project is on the list of the projects that require environmental impact assessment listed in Annex I and II of this Order, selects an expert from the list of environmental assessment practitioners published in accordance with relevant laws to conduct the study. The selected environmental impact assessment expert, on behalf of developer, submits an official application for environmental impact assessment of a proposed project to the authorized organ in form of a project brief together with proposed terms of reference for review and approval.

The ESIA is in direct compliance with the provision of this law, as this project is part of Category 1, requiring a full ESIA process.

2.2.10 Prime Minister's Order No 008/03 of 26/04/2021 Governing Environmental Protection Committees and Their Members

This Order determines the responsibilities, organisation and functioning of environmental protection committees hereafter referred to as "Committees". It also determines their members.

Article 2 sets out the general responsibilities of the Committees as follows: 1° to ensure the implementation of laws, policies, strategies, programs and action plans relating to climate change and protection, conservation and promotion of the environment; 2° to raise awareness of the population on environmental protection, climate change and proper land use;

The Order further provides for the specific responsibilities of the Committee at City of Kigali, District, Sector and cell level in its article 3,4,5,6 respectively. It provides also the members of the committees in its articles 7,8,9 and 10 at city of Kigali, District, Sector and cell level respectively.

The environmental committee at appropriate level (City of Kigali, District, Sector and Cell) shall be considered for the implementation of the project, and the ESMP. They will be overseeing and provide advice on how this project is being implemented in compliance with the environmental law and report any non-compliance to the relevant authorities.

2.2.11 Instruction Issued by the Rwanda Environment Management Authority (REMA) and Governing Inspection Process in Environmental Matters (No 001 of 10/01/2020)

Art 2 of this Instruction defines the Inspectors as staff in charge of environmental management in the Authority in charge of environmental management, in the City of Kigali and in all Districts.

Art 3 describes the mission of an inspector as:

- ensure that all projects, activities and products conform to applicable laws and to environmental standards;
- prepare inspection report and advise his / her institution on measures to be taken;
- provide the inspected person with technical recommendations related to environmental management following the inspection findings

The powers of inspectors are detailed in Art 4 as following:

1. to inspect installations, factories, stores, shops and retails outlets, construction, houses, machines, vehicles, devices and products;
2. to inspect records relating to the operations of the factory;
3. to take a sample of elements suspected of degrading the environment, measures, take action and propose the way forward;
4. to provisionally suspend or ban activities or materials considered to degrade the environment;
5. to impose an administrative fine provided for the relevant law;

Subsequent articles elucidate the conditions and process for inspection i.e. Inspection Notice (Art 5); Security measures (Art6); Inspection timing (Art 7).

Art 8 elaborates on key elements that an inspection needs to consider: all aspects of the project or activity with direct link to environment, including but not limited to:

1. if the site for the project activity is appropriate;
2. if the project or activity has got all required clearances;
3. if the product or activity is allowed;
4. if the environmental management plan was developed and is complied with;
5. if the technical standards are complied with;
6. if the health and security measures are taken and implemented.

Art 9; 10; and 11 highlight respectively the roles, obligations and rights of the inspected person. During the inspection process, the inspector should record all key findings (these have to be countersigned by the inspected person or his / her representative on the site) (Art 12). The inspector may also take samples of products for further analyses (costs for these analyses are borne by the inspected person) (Art 13). Furthermore, the inspector issues to the head of the institution an inspection report, highlighting details and evidence of the activities / products harmful to the environment and that are found during the inspection as well as recommended measures (Art 14). Inspector must also keep a registry of all inspection conducted (Art 15).

Art 16 specifies that the inspected person, who has received the inspection findings notification, shall submit to the institution which has conducted the inspection note containing remedial measures as well as an implementation plan that he/she will be undertaking in order to protect the environment. This implementation plan should include indicators, targets, responsible institution and timeframes. Upon completion of execution of adopted measures, the inspected person shall officially inform the institution which inspected him/her.

Art 17 provides for an administrative fine imposed through an imposition note duly signed by the Head of the Institution or the inspector, indicating inter alia, the amount to be paid, committed fault and the legal basis as well as the scene. The fine shall be paid through a specific account of the Fund for Environment.

The inspected person has the right to appeal against a decision after an inspection. The appeal must be addressed to the Director General of the Authority in charge of Environment, if the decision was taken by the City of Kigali or District (Art 17) or to the Minister in charge of Environment if the decision was taken by the Authority in charge of Environment (Art 18). In both cases, the appeal must be lodged within 15 calendar days of the receipt of the Inspection Report. With this appeal, the inspected person may request another inspection to be carried out by an independent and competent expert, at the expense of the inspected person. The Report of the Independent Expert shall be submitted to the concerned authority within 60 days (however the Independent Expert may request more days to complete the task) (Art 20).

The decision on the appeal shall be taken and communicated in writing to the person who made the appeal within 15 calendar days from the reception of the case, or the expert's report (Art 21).

In situation of the obstruction of the inspection, the person obstructing the inspection shall be charged of a fine provided by the law; if the obstruction persists, the owner shall be ordered to temporary stop his / her activities until the person is ready to cooperate with the inspection teams.

The implementation of the project / ESMP shall be in line with the provision of this Instruction by REMA.

2.2.12 Law Governing Electricity in Rwanda as Modified to Date (No 52/2018 of 13/08/2018 – modifying law No 21/2011 of 23/06/2011)

This Law governs activities of electric power production, transmission, distribution and trading within or outside the national territory of the Republic of Rwanda.

This law establishes a system of authorizing licenses for transmission, distribution and sale of electric power (Art. 5). The license is obtainable after a due filled application and payment of a license fee as determined by the regulatory agency.

Art. 8 under this law stipulates that the regulatory agency ensures prior to the issuance of a license, that the concerned individual or institution respect the rights of users and environment protection. Under this law, there is an establishment of Universal Access Fund whose main purpose is to optimize access to electricity in all areas of the country through cost effective means and minimized support.

With regards to the Right of Way, Art 47 provides for an authorization to operate in a public or a private domain to be granted for electricity transmission or distribution license holder. However, the Art 48 provides for an Expropriation of right of way for public interest. The right of way is necessary to the operators in production, transmission, distribution and supply of electricity. It shall be exercised in accordance with the standards set by the regulatory agency. Expropriation shall be conducted in accordance with the Law governing expropriation for public interest.

In case of issues arising from interference with property, Article 49 provides for their settlement and stipulates those complaints from license holders regarding interference with their property, including right of way, shall be brought to the regulatory agency for handling, and when deemed necessary, to the courts in accordance with laws.

2.2.13 National Social Protection Strategy (MINALOC, 2011)

This Strategy defines social protection across two main dimensions:

- As a Social Protection Sector, which essentially comprises the system of regular and predictable cash transfers that will provide income support to those living in poverty and vulnerable to falling into poverty;
- As a means of ensuring access to other public services – such as health and education – by enabling poor households to overcome the financial barriers that they may face.

In addition, the Strategy sets out a number of social development initiatives and complementary activities to social protection focused on helping poor households graduate out of poverty. The Social Protection Strategy plays an important role in enabling the government to tackle poverty and inequality across Rwanda. It complements other sector strategies already in place and is focused on enabling Rwanda to achieve its commitments as set out in the NST1 and the Vision 2050. In recent years Rwanda has managed to achieve a good level of economic growth. However, much remains to be done to reduce poverty. In 2006, almost 57 percent of the population still lived in poverty, while levels of inequality were on the rise. A number of categories of the population are particularly vulnerable to poverty, including older people, those living with disabilities, young children, female-headed households, genocide survivors and the historically marginalized. Young people are a group that also need support, given the difficulties many have in finding jobs due to low skill levels

2.2.14 Law Regulating Labour in Rwanda (N° 66/2018 of 30/08/2018) as Amended on 08/05/2023

Labour law is fundamental in creating and maintaining employee relations, high productivity and a conducive work environment. Rwanda revised its labour law in 2018 to align it to international best practice. The new labour law distinguishes between collective and individual labour disputes. Collective labour disputes refer to ‘disagreements between one or more employers on the one hand, and some or all employees on the other hand, which arises from collective convention or working conditions’ (Art. 3 clause 10, p.23). An individual labour dispute is defined as a disagreement between one or more employees and an employer as a result of a breach of the employment contract concluded between them’(Art 3 clause 11, p.24). The laws of Rwanda eliminate many potential causes of grievances in the workplace by prohibiting some forms of child labour, all forms of discrimination, forced labour, and sexual harassment. Minimum age for admission of employment is 16 years except that 13 – 15 years old children can do light work under apprenticeship. Children who are 13 years old and above can be employed for light work which does not have detrimental effect on education, health and physical development or other aspects of child’s interest (Art.3). The labour law guarantees right to freedom of opinion and association regarding working conditions, execution of work, and organization. This freedom includes right of employees and

employers to form, join and participate in employees' or employers' associations respectively (Articles 83 and 84). These associations have to be registered under the law (Art 85) and they enjoy legal personality after publication of their Articles in the Official Gazette of the Republic of Rwanda (Art 86). Legal personality grants the associations power to file cases in courts of law, represent employees or employers, acquire property, enter into agreements with other associations.

In accordance with this law, an employer is responsible to maintain health and safety of the workers at workplace. Employer is required to keep the workplace in a common state of cleanliness and presentation of hygiene & safety necessary for the health and safety of workers. The project implementers will uphold the provisions of this Act on the rights of the workers including right of employees to organize themselves in a labour union. Furthermore, the contractor shall also take note of the following orders:

- Ministerial Order Determining Conditions for Occupational Health and Safety (N°02 Of 17/05/2012)
- Ministerial Order Determining Modalities of Establishing and Functioning of Occupational Health And Safety Committees (N°01/Mifotra/15 Of 15/01/2015)

The Law regulating labour in Rwanda (Law N° 66/2018 of 30/08/2018 as amended on 08/05/2023) is directly relevant to the project as it governs employment conditions for all workers involved in the construction and operation of the transmission line. The project will ensure compliance with this law by applying fair recruitment practices, formal employment contracts, regulated working hours, and prohibition of child and forced labour. It will also enforce occupational health and safety measures, non-discrimination, and gender equality, while establishing workers' grievance mechanisms and codes of conduct. Compliance with this law will help minimize labour-related risks, including workplace accidents, conflicts, and GBV, and ensure that the project promotes safe and decent working conditions.

2.2.15 Ministerial Order Nº 02/MIFOTRA/22 of 30/08/2022 on Occupational Safety, Employees' and Employers' Organizations, Child Employment, Employment of a Foreigner, the Child and Circumstantial Leave.

This Order determines

1ºthe general occupational health and safety conditions in public service and private sector;
2ºmodalities and conditions for registration of employees' organizations or employers' organizations;
3ºprohibited works for a child aged between thirteen (13) and fifteen (15) years working in public service or private sector and light works that the child may perform in private sector;
4ºthe employment of a foreign employee in Rwanda; and

5ºcircumstantial leaves and modalities for granting them for employees under employment contracts.

However, the provisions of this Order relating to employment of a foreign employee in Rwanda do not apply to a foreign employee who

1° works in an embassy or international government organization operating in Rwanda; or

2° who works in Rwanda on the basis of the provisions of law on investment promotion and facilitation.

The Ministerial Order Nº 02/MIFOTRA/22 of 30/08/2022 is directly relevant to the project as it provides detailed regulations on occupational safety, labor relations, and employment conditions that must be applied during the construction and operation phases of the transmission line. The project will comply with this Order by ensuring safe working conditions through the provision of appropriate personal protective equipment (PPE), safety training, and enforcement of occupational health and safety procedures. It will also adhere to provisions related to child labor prohibition, employment of foreign workers, workers' rights, and leave entitlements, as well as facilitate proper engagement with workers' organizations where applicable. Compliance with this Order will help minimize workplace risks, ensure legal employment practices, and promote the welfare and protection of all workers involved in the project.

2.2.16 Ministerial Order 6 of 2010 Determining the List of Worst Forms of Child Labor, Their Nature, Categories of Institutions That Are Not Allowed to Employ Them and Their Prevention Mechanisms

This Order determines the list of worst forms of child labor, their nature, categories of institutions that are not allowed to employ them and their prevention mechanisms.

This Order, in its article 2, stipulates that the Worst forms of child labor prohibited to children are divided into three categories:

1° worst forms of child labor;

2° works that may affect the health, security or morality of the child;

3° works that may be dangerous to the health of the child.

Article 3 provides that the worst forms of child labour include:

1° to indulge children in slavery or similar practices;

2° children trafficking;

3° to turn them into debt bondage;

4° to replace them with mature people in forced labor;

5° to use them in conflicts and wars;

6° attract them into prostitution and to make use of them in these activities, to use them in all activities and in the production of pornography or for pornographic performances;

7° to use them in producing and trafficking of drugs.

The Ministerial Order No. 6 of 2010 determining the list of the worst forms of child labor is directly relevant to the project as it prohibits the engagement of children in hazardous activities typically associated with construction works, including excavation, handling heavy equipment, working at heights, and exposure to dangerous materials. The project will comply with this Order by enforcing strict age verification procedures, ensuring that no person below the legal working age is employed, and integrating clear provisions in contractor agreements to prohibit child labor. In addition,

awareness will be raised among contractors and local communities on child protection, and monitoring mechanisms will be established to prevent and detect any violations. Compliance with this Order will ensure that the project upholds children's rights and avoids exposure to hazardous or exploitative labor conditions.

2.2.17 Law N°59/2008 of 10/09/2008 on Prevention and Punishment of Gender- Based Violence

This Law is aimed at preventing and suppressing the gender- based violence. In its article 3 it stipulates that it is forbidden to use threat of depriving someone of certain rights for the purpose of having them indulge in any gender-based violence act. In its article 7 it dictates that the parent, trustee or any other person responsible for a child shall protect the latter against any gender based violence. It shall be forbidden not to cater for child under one's trusteeship just because of whether the child is male or female. In its article 9 it clarifies that It is forbidden to fire a woman just because she is pregnant or in maternity leave. Pregnancy and delivery shall not constitute cause for depriving a student of her right to education.

This law provides the penalties administered against GBV where in its article 16 stipulates that any person who is guilty with rape shall be liable to imprisonment of ten (10) years to fifteen (15) years. Where rape has resulted in a bodily or a mental illness, the person guilty with rape shall be liable to imprisonment of fifteen (15) years to twenty (20) years and medical care fees for the person raped shall be borne by him/her. Where rape has resulted in a terminal illness or death, the guilty person shall be liable to life imprisonment.

Law N° 59/2008 of 10/09/2008 on the prevention and punishment of Gender-Based Violence (GBV) is highly relevant to the project, particularly during the construction phase, which may involve labor influx and increased interaction between workers and local communities. The project will apply this law by implementing **GBV prevention and response measures**, including workers' codes of conduct, awareness and sensitization programs for both workers and communities, and confidential grievance mechanisms for reporting incidents. These measures will help mitigate risks of **sexual exploitation and abuse (SEA), sexual harassment (SH), and other forms of GBV**, ensuring that project activities are carried out in a manner that protects the dignity, safety, and rights of all community members, especially women and vulnerable groups.

2.3 Institutional Framework

2.3.1 Environment Institutional Actors

Ministry of Environment

The Ministry of Environment (MoE) was established to ensure the conservation, protection and development of the environment. It also ensures the safeguard of green and climate resilience for growth of the economy. MoE has the vision of protecting the environment for the safeguard of green and climate resilient Rwanda for growth of the economy. It, therefore, also oversees the environmental aspects of the energy sector and is responsible for the coordination and implementation of legislation and policies relating to the environmental impacts of energy production and consumption.

As stipulated in the Prime Minister's Order Nº 131/03 Of 23/12/2017 determining Mission and Functions, Organizational Structure, Job Profiles, Salaries and Fringe Benefits for Employees of the Ministry of Environment (MoE), the Ministry of Environment has the following main responsibilities:

1. To develop and disseminate the environment and climate change policies, strategies and programs through:
   – to develop strategies to promote partnership and enhance capacity of private sector to invest in activities of environment and climate change for sustainable economic development;
   – to develop laws and regulations to ensure protection of the environment and conservation of natural ecosystems;
   – To develop institutional and human resources capacities in environment and climate change.
2. To monitor and evaluate the implementation and mainstreaming of environment and climate change policies, strategies and programs across all sectors, especially productive sector;
3. To oversee and evaluate institutions under its supervision by providing guidance on the implementation of specific programs to be realised by the institutions under its supervision and local government;
4. To mobilize the necessary resources for the development, protection and conservation of the environment for the climate change adaptation and mitigation.

MoE is headed by the Minister, aided by the Permanent Secretary and counts 4 Technical Units, each headed by the Director General that divide responsibilities to implement the MoE's programs:

1. Environment and Climate Change Unit;
2. Land, Water and Forest Unit;
3. Mining Unit; and
4. Finance & Administration Unit

MoE has specific Authorities with specific mandates to implement particular programs related to Environment and Natural Resources management, namely:

1. Rwanda Environment Management Authority (REMA)
2. National Land Authority (NLA)
3. Rwanda Forestry Authority (RFA)
4. Rwanda Green Fund (FONERWA)
5. Rwanda Meteorological Agency (Meteo-Rwanda)

2.3.1.1 Rwanda Environment Management Authority (REMA)

Under the supervision of the Ministry of Environment, from the Law n°63/2013 of 27/08/2013 determining the mission, organization and functioning of Rwanda Environment Management Authority (REMA), REMA reserves the legal mandate for national environmental protection, conservation, promotion and overall management, including advisory to the government on all matters pertinent to the environment and climate change.

The mission of REMA is to promote and ensure the protection of the environment and sustainable management of natural resources through decentralized structures of governance and seek national position to emerging global issues with a view to enhancing the well-being of the Rwandan people.

REMA has a vision of ensuring that all sectors of the Rwandan Society value and undertake sound environmental management and rational use of natural resources in order to contribute to the national aspirations for sustainable development.

According to the said law instituting REMA, the following are the main responsibilities of REMA:

1. To implement Government environmental policy;
2. To advise the Government on policies, strategies and legislation related to the management of the environment as well as the implementation of environment related international conventions, whenever deemed necessary;
3. To conduct thorough inspection of environmental management in order to prepare a report on the status of environment in Rwanda that shall be published every two (2) years;
4. To put in place measures designed to prevent climate change and cope with its impacts;
5. To conduct studies, research, investigations and other relevant activities in the field of environment and publish the findings;
6. To closely monitor and assess development programs to ensure compliance with the laws on environment during their preparation and implementation;
7. To participate in the preparation of activities strategies designed to prevent risks and other phenomena which may cause environmental degradation and propose remedial measures;
8. To provide, where it is necessary, advice and technical support to individuals or entities engaged in natural resources management and environmental conservation;
9. To prepare, publish and disseminate education materials relating to guidelines and laws relating to environmental management and protection and reduce environmental degradation risks;
10. To monitor and supervise impact assessment, environmental audit, strategic environmental assessment and any other environmental study. REMA may authorize in writing, any other person to analyze and approve these studies.

Also Art 4 of the said law grants REMA powers enabling it to fulfill its mission.

These powers are:

1. To request any concerned institution or organ to submit an environment status report;
2. To visit without prior notice any project, building, industrial and business site in order to conduct inspection of activities harmful to environment.
3. To investigate offences in accordance with Law on Environment determining the modalities of protection, conservation and promotion of environment in Rwanda.
4. To order the suspension of activities contrary to the provisions of Law on Environment determining modalities of protection, conservation and promotion of the environment in Rwanda and other laws relating to the protection of environment.
5. To confiscate from any person various objects prohibited by laws relating to the protection of environment.
6. To receive aid, subsidies or donations; and

7. To grant awards and subsidies in order to sensitize people on environmental protection.

REMA as a parastatal is headed by the Director General, aided by the Deputy Director General and counts 5 Technical Units, namely:

1. Environmental Regulation & Pollution Control;
2. Research, Environmental Planning & Development;
3. Environmental Education & Mainstreaming;
4. Climate Change & International Obligations; and
5. Finance & Administration

2.3.1.2 Rwanda Development Board (RDB)

The Rwanda Development Board (RDB) is a government department that integrates all government agencies responsible for the attraction, retention and facilitation of investments in the national economy. RDB was established in 2009 to coordinate, spur and promote national economic development. The Executive Director's position is a cabinet-level position and the incumbent is appointed by and reports directly to the president of Rwanda. RDB measures its achievements in (a) direct foreign and domestic investments, (b) increased exports and (c) number of jobs created.

RDB is evidence that Rwanda is open for business. It is truly a one stop shop for all investors. It was set up by bringing together all the government agencies responsible for the entire investor experience under one roof. This includes key agencies responsible for business registration, investment promotion, environmental clearances, privatization and specialist agencies which support the priority sectors of ICT and tourism as well as SMEs and human capacity development in the private sector.

The RDB is independent and influential. It reports directly to the President and is guided by a Board that includes all the key Ministers (e.g., Finance, Trade, Infrastructure, and Agriculture). RDB is built with global expertise. It is modeled on international best practice examples of Singapore and Costa Rica. It has advisory and hands-on support from global entrepreneurs and experts from Singapore Development Board, World Bank, IFC and the Office of Tony Blair.

RDB's vision is to transform Rwanda into a dynamic global hub for business, investment, and innovation. Its mission is fast tracking economic development in Rwanda by enabling private sector growth.

As an agency for tourism promotion, RDB is also the overall agency for management of national parks, and therefore delivers the permission to undertake any activity within the limits of those national parks.

RDB deals also with issuing of ESIA Certificate for investment projects in the bid to ease business in Rwanda.

To operationalise the ESIA-related provisions of Law N° 48/2018 of 13/08/2018 on Environment and those of Ministerial Order N° 003/MoE/25 of 19/08/2025 relating to Environmental and Social Impact Assessment, which repealed Ministerial Order N° 001/2019 of 15/04/2019, the Rwanda Development Board (RDB) has issued the following guidelines in relation to the ESIA process.

1. *Before commencing implementation of business projects, investors are required to cross check whether their projects are required to undergo an ESIA, and application for ESIA Certificate should be addressed to RDB.*
2. *Procedures for obtaining an ESIA Certificate*

Step 1 – Submitting Project Brief by Investor / Developer

A project brief must be elaborated in such a manner that the RDB assessor easily understands all the aspects of the project. The project brief must contain at minimum:

- Name and address of the project developer;
- Main objectives of the project;
- Main components of the project and its variants;
- Description of the proposed site of the project with an emphasis on the main characteristics of the area such as soil properties, existing planned activities in the areas, existing ecosystems such as forests, rivers, lakes, water sources, wetlands; data on weather characteristics (rainfall, etc…;
- Size and expected duration of the project;
- Planned activities for the implementation of the project with the sequencing and duration of each phase;
- Type and quantity of the product output and raw materials;
- Main materials to be used and planned staffing
- Estimated project cost (if available)
- Any drawing or photos

Step 2 – RDB conducts a site visit

RDB upon receiving the project brief plans to conduct a site visit upon which terms of reference are prepared and transmitted to the developer. These terms of reference serve as the basis for carrying out an Environmental and Social Impact Assessment (ESIA) Study for the project. Developers can also prepare their own terms of reference and condition that he/she gets approval from RDB.

Step 3 – Conducting the ESIA Study

Based on the terms of reference, the developer at his / her own expenses, commissions an ESIA Study and submits the findings to the RDB. A list of ESIA Experts is published by the Rwanda Association of Professional Environmental Practitioners – RAPEP. Should the developer prefer to use an Expert who is not registered with RAPEP, he may submit to the Authority for approval.

Step 4 – RDB issues the ESIA Certificate

Once confirmation of compliance has been made by the RDB, an ESIA Certificate is provided to the developer. The process takes 15 days maximum.

Time frame for ESIA Certificate

- RDB submits terms of reference for ESIA Study within 15 working days of the reception of the project brief;

- RDB notifies the acceptance or refusal of the choice of the experts within 5 working days after reception of choice of team of experts; In case of refusal, RDB provides justification and recommends experts;
- Upon the reception of the ESIA Study Report, RDB analyses the report to verify its conformity with the terms of reference. The Authority accepts to issue the ESIA Certificate or requests additional information from the developer within 20 days;
- If RDB deems it necessary, it provides a public hearing notification within 15 days from the date of public notification

3. *Appealing an RDB ESIA Decision*

Where a project is not approved, the developer may appeal against the decision of the RDB to the Ministry of Environment within 30 days from the date of the notification of the decision.

2.3.1.3 Rwanda Association of Professional Environmental Practitioners (RAPEP)

The Rwanda Association of Professional Environmental Practitioners (RAPEP) is a professional association comprising environmental practitioners licensed to operate in the Republic of Rwanda and recorded on its register; and established by Law No 36/2016 of 08/09/2016. The Law determines also its organization and functioning.

RAPEP has legal personality and financial and administrative autonomy (Art 3) and has currently its Head Quarters in Kigali, the Capital City of the Republic of Rwanda. Art. 6 defines the responsibilities of RAPEP as follows:

1. To gather environmental assessment practitioners;
2. To analyze and find solutions to all problems related to the environmental assessment practitioners' profession;
3. To promote professionalism and proper conduct of members of RAPEP;
4. To exchange information relating to the environmental assessment practitioners' profession;
5. To represent interests of environmental assessment practitioners and advocate for them in Rwanda and abroad.

The organs of RAPEP (art. 9) include: (1) the General Assembly; (2) the Executive Committee; and (3) the Executive Secretariat; the law determines the composition, responsibilities, functioning and decision-making processes inherent to each RAPEP's organ. The Executive Committee, composed of 5 members including the Chairperson, Deputy Chairperson, the Secretary and two (2) Advisors, is responsible for the functioning of RAPEP (art. 15). All the members of the Executive Secretariat are elected by the General Assembly for a 3-year term renewable once. However, the Executive Secretary, supported by recruited staff, is responsible for the daily management of RAPEP activities. Art. 19 defines in detail the responsibilities of the Executive Secretary.

Furthermore, this law (Art 24) establishes also the Regulatory Council as a statutory organ responsible for organizing and supervising the environmental assessment profession and defines also the modalities for appointment of its members, and its functioning. As per Art 28, the responsibilities of the Regulatory Council are as follows:

1. To approve regulations and guidelines governing the environmental assessment practitioners' profession.
2. To advise government on the organization of the profession.
3. To monitor and exercise supervision and control over environmental assessment practitioners.
4. To take measures against the environmental assessment practitioners having committed professional misconduct.
5. To submit a quarterly activity report to the Minister of environment.
6. To notify RAPEP of instructions and decisions of the Regulatory Council.

Art 29 defines composition, functioning of the Regulatory Council.

This law clearly specifies that only licensed environmental practitioners appearing on RAPEP register are authorized to conduct an environmental impact assessment or an environmental audit (Art 31). However, a civil servant appearing on RAPEP register is not allowed to conduct environmental impact assessment and environmental assessment as long as he/she remains in service, with the exception of lecturers and researchers in institution of higher learning and universities. On the other hand, the Executive Committee of RAPEP publishes the list of environmental assessment practitioners not later than 31July of each year, with a copy to the Minister (Art 39). The law also specifies the conditions for the registration on and removal from the RAPEP Register of Environmental Practitioners.

It further clarifies the modalities inherent to the Organization of Environmental Assessment Practitioners' Profession in Rwanda.

RAPEP commenced its activities during the first and constituting General Assembly meeting, that was called on by the Minister of Environment and held in Kigali on Feb 9th, 2017. This meeting elected also members of the RAPEP Executive Committee. Since this day, RAPEP started officially its duties, principally with the registration and delivery of licenses to the environmental practitioners fulfilling the conditions as per the law.

2.3.2 Institutional Actors in the Electricity Sector

2.3.2.1 Ministry of Infrastructure (MININFRA)

The Ministry of Infrastructure (MININFRA) is responsible for four sectors: transport, energy, water and sanitation, urbanization-human settlements and housing. For the energy sector, MININFRA is in charge of the formulation, monitoring and assessment of policies and programs. Its mission is also to ensure the existence of a proper power generation capacity producing cost-effective energy, and to initiate programs to increase access to affordable energy and services. MININFRA ensures that quality standards and norms are implemented and is responsible for human resource capacities in the sector.

It supports infrastructure within the districts and is also responsible for harmonizing national infrastructure with regional plans (EAC). It has a role to promote private sector investment. MININFRA is mandated to "orient and supervise the functioning and management of public institutions, agencies and companies under the Ministry", including the Rwanda Energy Group

(REG) and its subsidiaries. Under Law N°21/2011 of 23/06/2011 Governing Electricity in Rwanda, the MININFRA approves electricity tariffs.

MININFRA is composed of different departments, including in particular a Policy and Planning Department supported by a Planning Division, and overseeing sector Divisions, including an Energy Division.

- Policy & Planning Department.
- Planning Division.
- Energy Division, comprising:
    - Division Manager (1);
    - Hydropower Energy Senior Engineer (1);
    - Fossil Energy Senior Engineer (1);
    - Energy Transmission & Distribution Senior Engineer (1); and
    - Energy Economist (1)

As part of its mandate, MININFRA is also running two capacity building programs including local and international training, exchange and coaching, namely: The Young Engineers Skills Development Program (YESDP) and the Strategic Capacity Building Initiative (SCBI). It is organized in coordination with the Ministries of Education, Finance, the Ministry of Public Service and Labor, the National Capacity Building Secretariat, development partners and local universities. MININFRA and the Energy Sector Wide Approach (eSWAP) Rwanda adopted a Sector Wide Approach (SWAP) to foster the Government's and donor's efficiency in the energy sector. It was first set up in 2008 between the Government, the AfDB, the WB, the EU, Belgium and the Netherlands. The eSWAP in Rwanda encompasses all donors active in the sector under one common sector investment program and ensures cross government coordination in energy related matters. In particular, the RUEAP is part of this sector wide approach which led to the development of a least cost rollout plan, medium term priority connection targets, a rollout strategy and a financing policy platform. The eSWAP Secretariat is hosted by the MININFRA and composed of four staff:

- Coordinator (1);
- Energy Policy & Economics Specialist (1);
- Monitoring & Evaluation Specialist (1); and
- Office Assistant (1)

The Energy Sector Working group (ESWG)

The ESWG, chaired by the MININFRA, is a high-level coordination and advisory body for the energy sector, which includes the key stakeholders, key ministries, government agencies, development partners, private sector representatives, civil society and NGOs.

2.3.2.2 Rwanda Energy Group Ltd (REG)

The Rwanda Energy Group Ltd (REG) and the Water and Sanitation Corporation Ltd (WASAC) result from the split in July 2014 of the former Energy and Water Sanitation Agency (EWSA). EWSA was created in 2011 by integrating the Rwanda Energy Corporation (RECO) and the

Rwanda Water and Sewerage Corporation (RWASCO). Both formed ELECTROGAZ before the national monopoly was unbundled in 2008.

REG's vision is "to be the most efficient and customer centric utility company in the region". It aims to transform the industry, its dynamic and performance, and to reinforce its customer centered operations in order "to provide sufficient and quality electricity to our customers at affordable and sustainable rates that support the socio-economic development of the country."

REG's key objectives are:

- Financial: Achieve financial solvency for the company
- Technical: Improve the scope and reliability of the supply and distribution of electricity from REG, including requests for new connections for all provinces and for all type of customers
- Operational: Increase the efficiency of REG operations, reducing cost and increasing the amount of electricity produced per employee.
- Commercial: Drastically improve the commercial operations and services of REG.

Prime Minister's Order Nº 87/03 of 16/08/2014 determined the modalities of transfer of responsibilities and property of the Energy, Water and Sanitation Authority (EWSA). Since REG Ltd has taken over the energy operations formerly under EWSA, the Group is composed of two subsidiaries, namely Energy Utility Corporation Limited (EUCL) and Energy Development Corporation Limited (EDCL).

The Energy Utility Corporation Limited (EUCL) is the subsidiary utility in charge of the day-to-day operation of generation facilities, transmission and distribution networks and the sale of electricity. EUCL plans the transmissions and distribution grids. Its current focus is geared toward consumer satisfaction, demand side management, technical and non-technical loss reduction and energy efficiency. As the sole power off taker in the country, EUCL is also responsible for negotiations and entering into Power Purchase Agreements with Independent Power Producers.

Energy Development Corporation Limited (EDCL) is the subsidiary in charge of developing new generation, transmission and energy access development projects. EDCL's mission is to develop new energy resources locally, bolster investment and develop projects in this field. It is also responsible for reviewing the power master plan and defining a least-cost power development plan. EDCL is therefore also in charge of regional power integration with neighboring countries and power pools. EDCL works closely with MININFRA.

2.3.2.3 Rwanda Utilities Regulatory Authority (RURA)

Rwanda Utilities Regulatory Authority (RURA) was initially created by the Law n° 39/2001 of 13 September 2001 with the mission to regulate certain public Utilities, namely telecommunications network and/or Telecommunications services, electricity, water, removal of waste products from residential or business premises, extraction and distribution of gas and transport of goods and persons.

This Law was further reviewed and replaced by Law Nº 09/2013 of 01/03/2013 establishing Rwanda Utilities Regulatory Authority (RURA) and determining its mission, powers, organization and functioning. This Law gives to RURA the mandate to regulate:

- Telecommunications, information technology, broadcasting and converging electronic technologies including the internet and any other audiovisual information and communication technology;
  - Postal services;
  - Renewable and non-renewable energy, industrial gases, pipelines and storage facilities;
  - Water;
  - Sanitation;
  - Transport of persons and goods;
  - Radiation Protection; and
  - Other public utilities, if deemed necessary.

The same Law gives the Authority a legal personality, financial and administrative autonomy in the fulfillment of its mandate. The Authority plays a pivotal role between the policy maker, licensed service providers and consumers. The Authority reports to the Office of the Prime Minister and it coordinates with line ministries responsible for each regulated sector in executing its functions.

In addition to the law creating RURA, there is a number of other legal and regulatory instruments which help RURA to discharge its responsibilities in each specific sector to be regulated. In the same vein, the Authority has the mission to ensure fair competition, promoting and protecting consumers' interests and rights in regulated sectors.

To be able to regulate public utilities, the Law Nº 09/2013 of 01/03/2013 gives to the Authority the following missions:

- To set up necessary guidelines in order to implement laws and regulations in force;
- To ensure compliance by public utilities with the provisions of laws and regulations governing the regulated sectors in an objective, transparent and non-discriminatory manner;
- To ensure the continuity of service delivery by the licensed or authorized service providers and the preservation of public interest;
- To protect users' and operators' interests by taking measures likely to guarantee effective, sound and fair competition in the regulated sectors within the framework of applicable laws and regulations;
- To protect and promote consumers' interests;
- To promote the availability, accessibility and affordability of regulated services to all consumers including low income, rural and disadvantaged consumers;
- To promote efficient development of regulated sectors in accordance with Government economic and financial policy;
- To promote and enhance general knowledge, sensitization and awareness of the regulated sectors including but not limited to:
- Promote and protect the rights and obligations of consumers and service providers;
- Issuing permits, authorizations and licenses required for regulated sectors, in accordance with the relevant laws and regulations;
- To monitor and ensure compliance by regulated network or service providers in line with their licenses, permits and concession obligations;
- To ensure fair competition in all regulated sectors.

To fulfill this mission, the Authority is vested with the powers including among others: carrying out investigations including inspections at service delivery sites; imposing administrative sanctions in case of a violation of laws and regulations; facilitating settlement of disputes related to regulated services; issuing directives to the regulated service provider as well as regulating tariffs.

2.4 International Conventions and Treaties

Rwanda is signatory of several international conventions or treaties with a direct link with biodiversity management and environment protection. Those are presented in Table 3.

Table 3: International Conventions to which Rwanda is party

No	Title of the Convention / Treaty	Subject of the Convention
1	Convention on Biological Diversity of 5 June 1992	Biological diversity conservation, sustainable use of its components and fair and equitable sharing of benefits resulting from genetic resource harvest
2	Cartagena protocol to the Convention on Biological Diversity on Biosafety, adopted on 29 January 2000 and entered into force on 11 September 2003	It is an international agreement which aims to ensure the safe handling, transport and use of living modified organisms (LMOs) resulting from modern biotechnology that may have adverse effects on biological diversity, taking also into account risks to human health.
3	Convention on International Trade in Endangered Species of Wild Fauna and Flora « CITES » of 3 March 1971	Control over international trade in species of wild fauna and flora that are, or might be, threatened with overexploitation
4	«RAMSAR Convention» on Wetlands, 1971	Convention relating to Conservation and rational use of Wetlands of International Importance, especially as waterfowl habitat and their resources
		In Rwanda Rugezi in northern province is one protected under this convention.
5	Convention on Conservation of Wildlife Migratory Species (CMS)	Conservation of migratory species whose major portion regularly and predictably crosses over one or several boundaries of domestic jurisdiction
6	African Convention on Conservation of Nature and Natural Resources	Adoption of measures for conservation, use and development of soils, water, flora and fauna in compliance with scientific principles and in the interest of populations

No	Title of the Convention / Treaty	Subject of the Convention
7	Convention on Plant Protection among State Members of the Great lakes Countries' Economic Community « CEPGL » of 25 February 1990	The convention aims at promoting cooperation in terms of plant protection among the CEPGL countries through its Agricultural and Animal Research Institute (IRAZ) and national bodies in charge of plant protection
8	Phytosanitary Convention for Africa of 13 September 1967	This convention aims at strengthening cooperation among African countries in fighting plants and crop products' enemies, and preventing their introduction and dissemination on national territories.
9	United Nations Framework Convention on Climate Change (UNFCCC)	To stabilize atmospheric concentration of greenhouse gases at a level that would prevent dangerous man-induced interferences with the climate system
10	Kyoto Protocol [extends the 1992 United Nations Framework Convention on Climate Change (UNFCCC)], adopted on 11 December 1997 and entered into force on 16 February 2005	The Kyoto Protocol is an international treaty which commits state parties to reduce greenhouse gas emissions, based on the scientific consensus that (part one) global warming is occurring and (part two) it is extremely likely that human-made CO_2 emissions have predominantly caused it.
11	Paris Agreement on Climate Change within the United Nations Framework Convention on Climate Change, adopted by consensus on 12 December 2015. As of February 2020, all UNFCCC members have signed the agreement, 189 have become party to it	The Paris Agreement deals with greenhouse-gas-emissions mitigation, adaptation, and finance, signed in 2016. The agreement's language was negotiated by representatives of 196 state parties at the 21st Conference of the Parties of the UNFCCC in Le Bourget, near Paris, France.
12	United Nations Convention to Combat Desertification	Its objective is to combat soil erosion and desertification in affected countries.
13	Vienna Convention for the Protection of the Ozone Layer Adopted on 22 March 1985 and entered into force on 22 September 1988	To protect human health and environment against harmful effects resulting from or that might result from human activities that modify or may modify the ozone layer
14	Montreal Protocol on Substances that Deplete the Ozone Layer (a **Protocol** to the Vienna Convention	It is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion.

No	Title of the Convention / Treaty	Subject of the Convention
	for the Protection of the Ozone Layer)	Under the Kigali Amendment countries promised to reduce the use of hydrofluorocarbons (HFCs) by more than 80% over the next 30 years. By December 27, 2018, 65 countries had ratified the Amendment. On January 1, 2019, the Kigali Amendment to the Montreal Protocol came into force.
15	Basel Convention on the Control of Transboundary movements of hazardous Wastes and their Disposal	Control of transboundary movements of hazardous wastes and their disposal. It aims at reducing the size of those exchanges in order to protect human health and environment by establishing a control system for exports and imports of hazardous wastes as well as their disposal
16	Bamako Convention on the ban of the import to Africa and the control of transboundary movement and management of hazardous wastes within Africa	Bamako Convention on the Ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa) is a treaty of African nations prohibiting the import of any hazardous (including radioactive) waste.
17	Rotterdam Convention on promotion of shared information on hazardous chemicals Adopted on 10 September 1998 and entered into force on 24 February 2004	This is a multilateral treaty to promote shared responsibilities in relation to importation of hazardous chemicals. The convention promotes open exchange of information and calls on exporters of hazardous chemicals to use proper labeling, include directions on safe handling, and inform purchasers of any known restrictions or bans.
18	Stockholm Convention on Persistent Organic Pollutants (POPs) Signed in 2001 and effective from May 2004	Is a multilateral environmental agreement to protect human health and the environment from chemicals, known as POPs. POPs have harmful impacts on human health or on the environment. They remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife. The Convention aims to eliminate or restrict the production and use of persistent organic pollutants.

No	Title of the Convention / Treaty	Subject of the Convention
19	MINAMATA Convention on Mercury Approved by delegates representing close to 140 countries on 19 January 2013 in Geneva and adopted and signed later that year on 10 October 2013	The Minamata Convention on Mercury is an international treaty designed to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds.

2.5 International Environmental and Social Frameworks, Procedures and Guidelines

2.5.1 World Bank's Environmental and Social Standards (ESSs) Applicable to the Project

The present project implementation is funded by the World Bank and therefore needs to comply with the WB's Environmental and Social Standards. The next table summarizes standards triggered by the project and borrower requirements:

Table 4: World Bank's Environmental and Social Standards applied to the project

S N	World Bank ESS	Relevance to the Project	Borrower / Project Compliance Requirements	How and Where Addressed in this ESIA
1	ESS1: Assessment and Management of Environmental and Social Risks and Impacts	Highly relevant as the project involves construction of a 21 km transmission line across agricultural land and wetlands, requiring identification and management of E&S risks.	Conduct ESIA, identify risks and impacts, apply mitigation hierarchy, and prepare ESMP in line with national laws and WB ESF.	Addressed throughout the ESIA, particularly in Impact Assessment, Mitigation Measures, and ESMP sections.
2	ESS2: Labor and Working Conditions	Relevant due to engagement of construction workers, including risks related to OHS, labor influx, and working conditions.	Prepare Labor Management Procedures (LMP); ensure fair treatment, non-discrimination, prohibition of child/forced labor, and OHS measures.	Addressed in Policy and Legal Framework, Impact Assessment (labour risks), and ESMP (OHS, Code of Conduct, GBV mitigation).

SN	World Bank ESS	Relevance to the Project	Borrower / Project Compliance Requirements	How and Where Addressed in this ESIA
3	ESS3: Resource Efficiency and Pollution Prevention and Management	Relevant due to potential impacts such as dust, noise, waste generation, and use of fuels and oils during construction.	Promote efficient resource use; manage waste, hazardous materials, and emissions in line with GIIP and national regulations.	Addressed in Impact Assessment (air, soil, water) and ESMP (waste and pollution control measures).
4	ESS4: Community Health and Safety	Relevant due to risks from construction activities, traffic movement, communicable diseases, and electrical hazards during operation.	Assess and mitigate risks including traffic safety, communicable diseases, GBV/SEA, and emergency preparedness.	Addressed in Impact Assessment (community health and safety) and ESMP (traffic plan, HIV/AIDS awareness, GBV Action Plan).
5	ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Highly relevant as the project affects **797 households**, including land acquisition and physical/economic displacement within the RoW.	Ensure compensation prior to land acquisition; prepare and implement RAP; establish grievance mechanism and stakeholder engagement.	Addressed in the RAP report, referenced in ESIA under Socio-economic Impacts and Stakeholder Engagement sections.
6	ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant due to vegetation clearing, wetland crossings (Rugeramigozi and Gasenyi), and potential impacts on fauna (e.g. birds).	Apply mitigation hierarchy; avoid sensitive habitats; assess biodiversity risks; implement protection and restoration measures.	Addressed in Biodiversity Baseline, Impact Assessment (flora/fauna), and ESMP (biodiversity and wetland measures).

SN	World Bank ESS	Relevance to the Project	Borrower / Project Compliance Requirements	How and Where Addressed in this ESIA
7	ESS8: Cultural Heritage	Potentially relevant as excavation works may uncover unknown cultural resources.	Implement chance-find procedures; ensure protection of cultural heritage and continued access where applicable.	Addressed in Impact Assessment (cultural heritage) and ESMP (Chance Find Procedure).
8	ESS10: Stakeholder Engagement and Information Disclosure	Highly relevant due to engagement with PAPs, local authorities, and institutions (e.g. IUCN, REMA) throughout ESIA and RAP processes.	Prepare and implement SEP; ensure consultations, disclosure, and grievance redress mechanism.	Addressed in Public Consultation and Stakeholder Engagement Chapter and **Grievance Redress Mechanism section**.

2.5.2 World Bank Group Environmental, Health and Safety Guidelines

2.5.2.1 Environmental, Health, and Safety General Guidelines

The Environmental, Health, and Safety (EHS) Guidelines[1] are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP) that WB funded project should apply. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. The ASCENT will apply both the General EHSG and Electric Power Transmission and Distribution EHSG.

The applicability of the Environmental, Health and Safety (EHS) Guidelines has been tailored to the specific risks and impacts identified for the proposed Construction of the 110 kV Double Circuit Cut-in Cut-out Transmission Line Kigoma SS – Mt Kigali SS (21 km). Based on the findings of the environmental and social assessment, the main site-specific risks include vegetation clearing within the Right of Way, disturbance of agricultural land and wetlands, soil erosion from excavation works, dust and noise emissions during construction, occupational and community health and safety risks, and potential impacts on biodiversity, including avifauna.

Accordingly, relevant provisions of the EHS Guidelines have been selectively applied to address these risks. For example, dust suppression and noise control measures will be implemented in built-up areas; erosion control and site rehabilitation measures will be applied in sloped and exposed sections; waste and hazardous material management practices will be enforced to prevent soil and

[1] http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines

water contamination; and occupational health and safety requirements, including use of personal protective equipment (PPE) and safe work procedures, will be strictly followed. In addition, community health and safety measures, including traffic management and awareness programs on communicable diseases, will be implemented.

Given that the project is located mainly in agricultural and modified environments with no critical habitats or protected areas, the application of the EHS Guidelines focuses on minimizing disturbance and restoring affected areas rather than complex biodiversity offsets. Where national regulations differ from the EHS Guidelines, the project will apply the more stringent requirements. Any deviation from the EHS Guidelines will be justified within the ESIA and ESMP to ensure that human health and environmental protection are not compromised.

General Approach to the Management of EHS Issues at the Facility or Project Level:

The management of Environmental, Health, and Safety (EHS) issues for the proposed 110 kV Kigoma–Muhanga transmission line has been adapted to the specific risks identified in the ESIA. These include vegetation clearing within the Right of Way, soil erosion from excavation works, disturbance to agricultural land and wetlands, dust and noise emissions, occupational and community safety risks, and potential biodiversity impacts.

EHS considerations have been integrated into project planning and design, including route selection to avoid sensitive areas and minimize resettlement. Qualified E&S specialists will oversee implementation of mitigation measures, including erosion control, waste management, dust suppression, and worker safety procedures. Risk management focuses on preventing impacts at source, such as limiting unnecessary vegetation clearing and avoiding construction in sensitive wetland sections where possible. Where avoidance is not feasible, appropriate engineering and management controls will be applied.

The project will also implement occupational health and safety measures, emergency preparedness, and community awareness programs to address risks such as accidents, traffic, and communicable diseases. Continuous monitoring and supervision will be carried out to ensure compliance and improve EHS performance throughout the project lifecycle.

Table 5: Environmental Health and Safety Guidelines

Effect	Description	Management	Project-Specific Relevance and Measures
Environment			
Greenhouse Gases (GHGs)	Energy projects may generate GHGs contributing to climate change.	Promote renewable energy and energy efficiency.	The project itself does not generate significant GHG emissions, as it is a transmission line (not generation). However, it contributes positively by improving grid reliability and enabling efficient evacuation of electricity, including renewable energy sources connected to the grid. Construction emissions from vehicles and machinery will be temporary and minimal, controlled through proper maintenance.
Hazardous Materials	Includes fuels, oils, and other potentially harmful substances.	Safe handling, storage, and disposal; avoid uncontrolled releases.	Limited hazardous materials (mainly fuel, lubricants, and transformer oils) will be used during construction and maintenance. The contractor will implement controlled storage areas, spill prevention measures, and proper waste oil collection, with no use of PCB-containing equipment.
Waste	Solid and liquid waste generated from activities.	Waste minimization, reuse, recycling, and safe disposal.	Construction activities will generate excavation waste, vegetation debris, and domestic waste from workers. Waste will be segregated, collected, and disposed of through authorized service providers, and sites will be rehabilitated after works.
Occupational Health and Safety (OHS)			
Approach	Protection of workers through hazard identification and control.	Apply hierarchy of controls and provide PPE.	Key risks include working at heights (tower erection), electrical hazards, and equipment handling. The contractor will implement a site-specific OHS Plan, provide PPE (helmets, harnesses, gloves), and conduct regular safety training.

Effect	Description	Management	Project-Specific Relevance and Measures
Workplace and Exit	Safe working environment and emergency preparedness.	Ensure safe access, emergency exits, and first aid.	Temporary construction sites will be organized to ensure safe access, clear movement paths, first aid availability, and emergency response procedures, especially during tower installation and stringing activities.
Fire and Explosions	Risks from flammable materials.	Safe storage and fire prevention measures.	Fire risks are low but possible due to fuel storage. The project will ensure safe storage of fuel, prohibition of open flames, and availability of fire extinguishers at work sites.
Electrical Hazards	Risks from energized equipment and lines.	Lockout/tagout, warning signs, safe distances.	Significant during operation and maintenance phases. Measures include clear marking of high-voltage areas, establishment of safety distances, and strict adherence to electrical safety procedures during maintenance.
Personal Protective Equipment (PPE)	Protection against residual risks.	Provide and maintain appropriate PPE.	All workers will be equipped with appropriate PPE based on tasks, including safety harnesses for working at heights and insulated gear for electrical works.
Accidents and Disease Monitoring	Monitoring workplace incidents and health risks.	Reporting, investigation, and corrective action.	The project will implement an incident reporting system, conduct investigations, and integrate HIV/AIDS awareness programs for workers and communities.
Community Health and Safety			
Communicable and Vector-borne Diseases	Risks from labor influx and poor sanitation.	Awareness, prevention, and collaboration with health authorities.	The project may introduce limited labor influx, increasing risks of communicable diseases. Measures include HIV/AIDS awareness campaigns, workers' code of conduct, and prioritization of local labor to reduce external workforce presence.

Effect	Description	Management	Project-Specific Relevance and Measures
Traffic and Public Safety	Risks from movement of construction vehicles.	Traffic management and community awareness.	Transport of materials and equipment may cause temporary traffic disruption and safety risks. The project will implement traffic management plans, signage, and community awareness measures.
Biodiversity and Habitat Disturbance	Loss of vegetation and disturbance to fauna.	Minimize clearing and restore habitats.	The project will cause vegetation clearing within the Right of Way (RoW) and limited disturbance to fauna. Measures include minimizing clearing, avoiding sensitive wetland sections where possible, and rehabilitating disturbed areas.
Soil and Water Impacts	Erosion and contamination risks.	Erosion control and pollution prevention.	Excavation for tower foundations may cause soil erosion, especially in sloped areas. Mitigation includes controlled excavation, backfilling, and drainage management, as well as spill prevention near wetlands.

2.5.2.2 Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution

The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas.

2.5.2.3 Specific Impacts and Management

The following section provides a summary of EHS issues associated with electric power transmission and distribution that occur during the construction and operation phases of a facility, along with recommendations for their management

Table 6: Summary of EHS Guidelines for Electric Power Transmission and Distribution

Effect	Description	Relevance to the Project	Management (Project-Specific Measures)
Design and Planning Phase			

Effect	Description	Relevance to the Project	Management (Project-Specific Measures)
Poor site selection	Poor selection of project sites may lead to environmental degradation such as destruction of sensitive ecosystems.	The transmission line crosses agricultural land and wetlands (e.g., Rugeramigozi and Gasenyi), with no protected areas identified. Risk relates to route alignment and tower siting.	- Optimize route alignment to avoid sensitive areas and minimize wetland crossing.- Maintain natural water flow and irrigation channels in wetlands.- Avoid densely populated zones where feasible.- Comply with Rwanda environmental regulations and ESIA recommendations.
Technical assistance, policy and regulatory improvement	Poor planning may result in weak environmental integration.	Relevant in ensuring design decisions (alignment, RoW width, tower locations) integrate environmental and social considerations.	- Integrate ESIA findings into final design.- Ensure coordination between engineers and E&S specialists.- Apply WB ESF and national requirements during detailed design.
Construction Phase			
Terrestrial habitat alteration (RoW)	Clearing of vegetation may alter habitats.	The project requires clearing of vegetation within the 25 m RoW, mainly in agricultural land.	- Minimize vegetation clearing to only required RoW.- Avoid unnecessary tree cutting.- Restore disturbed areas after construction.- Maintain low vegetation compatible with transmission lines.
Forest fires	Vegetation accumulation may increase fire risk.	Risk is low–moderate due to agricultural landscape but possible during dry seasons.	- Clear and manage vegetation within RoW.- Avoid burning of cleared biomass.- Schedule works outside high fire-risk periods.- Sensitize workers on fire prevention.
Avian and bat collisions	Birds may collide with transmission lines.	Moderate relevance due to wetlands and open landscapes, though no major flyways identified.	- Install bird diverters/markers in wetland sections.- Avoid routing near bird congregation areas where possible.- Monitor bird interactions during operation.

Effect	Description	Relevance to the Project	Management (Project-Specific Measures)
Aquatic habitat alteration	Construction may disturb wetlands and watercourses.	Relevant for Rugeramigozi and Gasenyi wetlands crossings.	- Minimize works within wetlands.- Avoid blocking water flow.- Install erosion and sediment control measures.- Restore disturbed wetland areas after works.
Hazardous materials	Fuels, oils, and chemicals may cause pollution.	Limited use of fuel, lubricants, and transformer oils during construction.	- Store fuels in bunded areas away from water sources.- Implement spill prevention and response plans.- Prohibit use of PCB-containing equipment.
Insulating oils and fuels	Oils used in transformers pose contamination risk.	Relevant mainly during operation and maintenance.	- Use non-PCB transformers.- Provide containment systems for oil leaks.- Regular inspection and maintenance of equipment.
Wood preservatives	Treated poles may contain chemicals.	Low relevance as project mainly uses steel towers.	- Prefer steel lattice towers over treated wooden poles.- Ensure safe disposal if treated wood is used.
Projects in sensitive areas	Projects in protected or critical habitats.	Not applicable as no protected areas are crossed.	- Maintain compliance with ESIA findings.- Apply precautionary approach near wetlands.
Occupational Health and Safety (OHS)			
Live power lines	Risk of electrocution during works.	High relevance during stringing and maintenance.	- De-energize lines during works.- Use trained and certified workers.- Apply lock-out/tag-out procedures.
Working at height	Falls from towers and structures.	High risk during tower erection and stringing.	- Use fall protection systems and harnesses.- Train workers on working at height.- Inspect climbing equipment regularly.
EMF exposure (workers)	Exposure to electromagnetic fields.	Relevant mainly during operation/maintenance.	- Limit exposure time.- Maintain safe working distances.- Provide worker awareness and training.

Effect	Description	Relevance to the Project	Management (Project-Specific Measures)
Exposure to chemicals	Exposure to fuels and oils.	Limited but present during construction.	- Provide training on handling hazardous materials.- Ensure hygiene and safe storage practices.
Community Health and Safety			
Electrocution	Public exposure to live lines.	Relevant during operation phase, especially near settlements.	- Install warning signs and barriers near towers.- Maintain safe clearance distances.- Conduct community awareness campaigns.
Soil and water pollution	Contamination from spills and construction.	Relevant near wetlands and agricultural land.	- Store materials properly.- Prevent spills and manage waste.- Rehabilitate disturbed land.
Noise	Noise from construction equipment.	Temporary impact in settlements along the route.	- Limit works to daytime hours.- Maintain equipment.- Inform communities in advance.
Ozone Depleting Substances	Use of harmful substances.	Not relevant to this project.	- Ensure no use of ODS substances.- Comply with national and international regulations.
Operation Phase			
Electric and Magnetic Fields (EMF)	Potential public exposure to EMF.	Low–moderate relevance near houses close to RoW.	- Maintain minimum clearance distances.- Avoid routing near sensitive receptors where possible.- Monitor EMF levels if needed.

2.5.2.4 Performance Indicators and Monitoring

Environment: Environmental monitoring activities should be based upon potential Environmental Health and Safety direct or indirect risks including emissions, effluents, and resource use applicable to the project among others. Monitoring frequency should be enough to provide representative data for the parameter being monitored. Monitoring data should be analysed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken.

Occupational Health and Safety: Projects should try to reduce the number of accidents among project workers (whether directly employed or subcontracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities. Facility rates may be benchmarked against the performance of facilities in this sector in developed countries through consultation with published sources. Facilities should also maintain a record of occupational accidents and diseases and dangerous occurrences and accidents.

2.5.3 Rwanda ESIA Guidelines and WB-ESF

Both the WB ESF and the Law on Environment champion safeguarding against adverse impacts of projects on the environment and affected people. Where the borrower's country's environmental and social laws and regulations, including those laws implementing borrower's obligations under international law, are deficient, ESF provisions will take precedence. The ESF were also considered in the preparation of the ESIA report.

Table 7: Gap Analysis Between World Bank ESF and Rwanda National Laws

Environmental and Social Standard (ESS)	World Bank Requirements	Rwanda National Laws	Gap Analysis	Recommended Actions
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	World Bank ESF requires comprehensive Environmental and Social Impact Assessment (ESIA) that identifies and manages both environmental and social risks, including stakeholder engagement throughout the project lifecycle.	Law No. 48/2018 of 13/08/2018 (Environmental Law), mandates Environmental Impact Assessments (ESIA) for projects with significant environmental risks.	Rwanda's legal framework emphasizes environmental risks through ESIAs but lacks provisions on comprehensive social risk management and systematic stakeholder engagement, which is essential under ESS1. Furthermore, there are no explicit requirements for continuous engagement during project implementation. ESS1 requires ongoing stakeholder engagement, while Rwanda's ESIA stops primarily at project approval.	All projects should be screened for E&S Impacts classification. The WB ESF should be used for impact classification and the national law used to determine the ESIA category required (full ESIA, Partial ESIA or no ESIA required). The Social Component should be catered for.

Environmental and Social Standard (ESS)	World Bank Requirements	Rwanda National Laws	Gap Analysis	Recommended Actions
ESS2: Labor and Working Conditions	World Bank ESF mandates fair treatment of workers, non-discrimination, the right to organize, and a safe, healthy work environment, alongside grievance redress mechanisms for workers.	Rwanda Labor Law No. 66/2018 of 30/08/2018 covers workers' rights, including non-discrimination, protection from Sexual harassment and occupational health and safety standards and abolition of forced labor and child labor among others.	While Rwanda's Labor Law aligns well with ESS2 in terms of worker rights and safety, it lacks comprehensive mechanisms for addressing worker grievances and ensuring accountability through independent monitoring.	The project will follow ESS2 and has developed labour management procedures with relevant provisions to bridge the gap. The project will prepare also the Occupational Health and Safety Plan prior to the field works The project will comply with the Ministerial order No2 of 17/05/2012, but it will monitor wages paid. The minimum age of employment should be defined in the Labour Management Plan (LMP) as 16 years. The project should not allow any forced labour.

Environmental and Social Standard (ESS)	World Bank Requirements	Rwanda National Laws	Gap Analysis	Recommended Actions
ESS3: Resource Efficiency and Pollution Prevention and Management	World Bank ESF promotes efficient use of resources and pollution prevention, as well as mitigating climate change through cleaner technology and efficient energy use.	Rwanda's Environmental Protection Law No. 48/2018, Article 7, addresses pollution prevention and resource efficiency, especially in industrial processes and waste management.	Rwanda's law covers general pollution control but does not explicitly address climate change mitigation or the use of cleaner technology, as mandated under ESS3. World Bank requirements call for explicit measures to enhance resource efficiency and mitigate greenhouse gas emissions, which is not fully reflected in Rwanda's current legal provisions.	The project will follow provisions of ESS3 and national requirements on resource efficiency in its activities to ensure compliance with the requirements and site specific ESMPs will be developed. The project should promote sustainable use of resources and avoid or minimize environmental pollution in line with the WB ESF.

Environmental and Social Standard (ESS)	World Bank Requirements	Rwanda National Laws	Gap Analysis	Recommended Actions
ESS4: Community Health and Safety	ESS4 requires a comprehensive approach to assessing and managing risks that projects pose to the health, safety, and security of affected communities, including traffic and road safety, hazardous materials management, and emergency preparedness.	Rwanda Labour Law No. 66/2018 (through its occupational health and safety provisions) focuses more on workplace safety but indirectly relates to community health and safety.	Gaps exist in how community health and safety are addressed under Rwandan law. While occupational health and safety are covered, Rwanda's law does not extend these protections fully to surrounding communities affected by projects. ESS4 also requires a more robust plan for emergency preparedness and response, which is less developed in Rwanda's legal framework.	ESS4 will be applied regarding the anticipation and avoidance of adverse impacts on the health and safety of project-affected communities. The project will ensure that workers and the general public are not exposed to vector borne diseases, STDs and construction and operation related safety hazards.

Environmental and Social Standard (ESS)	World Bank Requirements	Rwanda National Laws	Gap Analysis	Recommended Actions
ESS5: Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement	ESS5, provides for compensation, resettlement planning, and livelihood restoration for affected people. It also stresses the need for avoiding forced evictions and involuntary resettlement whenever possible.	Rwanda Expropriation Law No. 32/2015 requires fair compensation during expropriation processes, but it does not explicitly mandate livelihood restoration.	A significant gap exists in post-resettlement support. While Rwanda's law ensures fair compensation, it does not mandate the restoration of livelihoods or provide detailed provisions for post-resettlement assistance. ESS5 requires comprehensive resettlement planning and support beyond monetary compensation, including measures to restore economic activities for affected populations.	ESS5 will be used because it provides a wider window to explore all sorts of assistance that may need to be applied depending on site specific context, PAPs and community special circumstances, and also the livelihood is well elaborated.

Environmental and Social Standard (ESS)	World Bank Requirements	Rwanda National Laws	Gap Analysis	Recommended Actions
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	ESS6 focuses on the conservation of biodiversity, especially in critical habitats, and sustainable resource use, promoting the mitigation of environmental impacts on living natural resources.	Rwanda's Environmental Law covers biodiversity protection and sustainable management of critical habitats.	While national laws align well with ESS6 on biodiversity conservation, World Bank standards are more detailed, particularly regarding the management of critical and natural habitats. The World Bank requires more stringent measures to avoid and mitigate impacts on biodiversity, Rwanda's laws offer general protections without as much specificity.	Apply ESS6 the more stringent.
ESS8: Cultural Heritage	ESS8, Article 8.1 protects both tangible and intangible cultural heritage, ensuring that project implementation does not harm cultural assets and requires consultation with communities regarding intangible heritage.	Rwanda's Cultural Heritage Law No. 15/2014, Article 7 primarily focuses on the protection of physical (tangible) cultural heritage.	The key gap here is the lack of focus on intangible cultural heritage in Rwanda's law. ESS8 requires more engagement with communities to protect both tangible and intangible cultural assets, which is less emphasized in Rwanda's legal framework.	ESS8 will be applied as it explicitly covers both tangible and intangible cultural heritage.

Environmental and Social Standard (ESS)	World Bank Requirements	Rwanda National Laws	Gap Analysis	Recommended Actions
ESS10: Stakeholder Engagement and Information Disclosure	ESS10 mandates continuous, meaningful engagement with stakeholders throughout the project lifecycle, including full information disclosure and grievance mechanisms.	Rwanda's Environmental Law No. 48/2018, requires public participation, but only during the project approval phase.	The gap lies in the lack of ongoing stakeholder engagement during the implementation and operation phases of projects. ESS10 emphasizes a continuous, iterative process for stakeholder consultation and feedback, while Rwanda's law does not extend engagement beyond the initial ESIA process. Additionally, there is no comprehensive grievance mechanism that stakeholders can access during project implementation.	ESS10 will be used during project implementation. The Project will implement stakeholder consultations throughout the lifetime of the project, as per the prepared Stakeholder Engagement Plans.

Chapter III: Description of the Project

Energy is increasingly proving to be a basic essential without which true development is not possible. So, access to energy and, in particular, to electricity is an essential driver for development due to its effect on poverty and hunger, health, education, on improving living conditions, reducing the exodus from the countryside and on the environment. Making electricity available in homes reduces the use of batteries and also the often-excessive use of biomass. The use of electricity of hydroelectric origin also makes it possible to prevent the production of greenhouse gases such as CO_2 caused by the burning of wood and coal for heating and cooking.

3.1 Description of the Project Sites and Major Environmental Challenges

The study was carried out in the following districts within the territory of Rwanda:

Construction of the 110 kV Double Circuit Cut-in Cut-out Transmission Line Kigoma SS – Mt Kigali SS (21 km). The project areas are in two districts of the southern Province of Rwanda with equatorial climate tempered by altitude, characterized by mild, stable temperatures and moderate precipitation according to a cycle of four seasons with two dry seasons (January – February / June – August) and two rainy seasons (March – May / September – December).

These areas are part of a landscape already transformed by long-standing agricultural activities. To confirm the environmental characteristics and inform route optimization, the Consultant undertook a systematic field survey along the entire 21 km transmission line corridor, covering all affected cells and villages within Muhanga District (Nyamabuye Sector) and Ruhango District (Byimana, Mbuye, and Ruhango Sectors). The fieldwork was conducted jointly with the project technical team and complemented by a review of available secondary data, including existing environmental reports, national land use maps, and biodiversity information relevant to the project area.

The field survey involved direct observations, walk-through inspections along the proposed alignment, and rapid biodiversity screening, with particular attention to wetlands, vegetation types, settlement patterns, and environmentally sensitive features. This approach enabled the identification and validation of key constraints and informed the selection of alignment alternatives aimed at minimizing environmental and social impacts, including resettlement.

Findings from both the field investigations and literature review confirmed that the transmission line predominantly traverses modified habitats, including eucalyptus and grevillea woodlots, coffee and banana plantations, and cultivated fields (e.g., maize and beans), with limited presence of natural habitats. Although the line crosses agricultural wetlands such as Rugeramigozi, these crossings are designed as overhead spans, with no tower foundations located within wetland boundaries, thereby avoiding direct physical disturbance. In addition, the alignment was refined to avoid densely populated areas where feasible, and it was confirmed that no legally protected areas or critical habitats are intersected by the project.

The 25 m right of way for 110 kV transmission lines complies with Guidelines N°01/GL/EL-EWS/RURA/2015 ON Right-of-Way for Power Lines. The routes studied were aimed at avoiding sensitive environmental elements and constraints in the land crossed. There is generally a right of way of 25 meters in which no other permanent structure is allowed. Within this right of way of

25m width, all vegetation exceeding 4-5 meters in height will be eliminated including trees outside the right of way, which represent a potential risk of falling onto the lines. However, several crops, which do not exceed a height of 4-5 meters, banana trees in particular, and compatible activities such as agriculture and livestock grazing shall be permitted in the right of way area. In addition to the ground area permanently required for the construction of the pylons (100 m² per 110 kV pylon), other areas will be necessary for the tracks, temporal storage sites and access roads.

Figure 1: Map of Rwanda districts showing location of the project

3.2 Scope of the Project

The project titled Construction of 110 kV Double Circuit Transmission Line (Cut-in Cut-out) Kigoma SS – Mt Kigali SS (21 km) focuses exclusively on the development of a high-voltage transmission line under Component 2 of the ASCENT Project. Unlike earlier descriptions, this subproject does not include the construction of the Muhanga Substation, which is implemented under a separate subproject. The present scope is therefore limited to the transmission infrastructure required to connect into the existing grid and improve network reliability.

The project involves the construction of a **21 km double circuit 110 kV transmission line**, designed as a **cut-in/cut-out connection** from the existing Kigoma–Mt Kigali transmission line. This configuration will allow power to be tapped and re-injected along the main transmission corridor, thereby enhancing grid stability, operational flexibility, and redundancy in the Southern Province of Rwanda.

The transmission line will traverse Muhanga District (Nyamabuye Sector only) and Ruhango District (Byimana, Mbuye, and Ruhango Sectors), passing predominantly through agricultural land and built-up areas. The project will require the establishment of a Right of Way (RoW) of 25 meters, in accordance with the Rwanda Utilities Regulatory Authority Guidelines No. 01/GL/EL-EWS/RURA/2015 on Right-of-Way for Power Lines in Rwanda. Within this corridor, land acquisition will be limited to tower foundation locations, while the remaining RoW will be subject to use restrictions rather than permanent acquisition.

A total of 69 transmission towers will be installed along the 21 km corridor, including all associated infrastructure such as conductors, insulators, grounding systems, and access tracks for construction and maintenance. The implementation will cover all project phases, including pre-construction (detailed design and surveys), construction (site clearance, excavation, tower erection, and stringing), and operation and maintenance.

Socially, the project is expected to affect 797 Project Affected Households (PAHs) across the project area. These households are distributed across multiple administrative units in Muhanga and Ruhango Districts, with impacts primarily related to land use restrictions within the RoW, and localized land acquisition at tower locations.

Environmentally, the transmission line crosses mainly modified landscapes (agriculture and settlements), including agricultural wetlands, but does not traverse protected areas or critical habitats. Therefore, the project scope includes the implementation of targeted mitigation measures to manage potential impacts on wetlands, biodiversity, soils, and community health and safety, in line with good international industry practice.

Table 8: Number and location of the Project Affected Households

District	Sector	Cells	Villages	Project Affected Households
Muhanga	Nyamabuye	Gahogo	Gihuma	53
Ruhango	Byimana	Kirengeri	Gahengeri	216
			Gatoki	
			Kamonyi	
			Kigarama	
			Kirengeri	
			Masaka	
			Nyamirambo	
		Mpanda	Gatwa	86
			Karenge	
			Mpanda	
		Muhororo	Bukomero	87
			Kamonyi	
			Kigarama	
			Nyarunyinya	
			Rutembo	
		Ntenyo	Bugarura	135
			Kamurenzi	
			Mucubi	
		Nyakabuye	Gatobotobo	30
			Gatwa	
			Ndego	
	Mbuye	Kizibere	Bereshy	63
			Bunyeshywa	
	Ruhango	Tambwe	Buterana	127
			Nyamugari 1	
			Nyundo	
Total				797

3.3 Area of Influence

The Area of Influence (AoI) for the Construction of 110 kV Double Circuit Transmission Line (Cut-in Cut-out) Kigoma SS – Mt Kigali SS (21 km) includes all areas that may be directly or indirectly affected during the project lifecycle. The primary AoI consists of the 21 km transmission line corridor, including the 25 m Right of Way (RoW) in line with Rwanda Utilities Regulatory Authority guidelines, as well as the footprints of the 69 tower locations where permanent land acquisition will occur. This area covers parts of Muhanga District (Nyamabuye Sector) and Ruhango District (Byimana, Mbuye, and Ruhango Sectors), directly affecting 797 Project Affected Households (PAHs) through land use restrictions, crop and tree losses, and localized construction disturbances. The secondary AoI includes surrounding areas that may experience indirect or temporary impacts such as noise, dust, traffic, and access disruptions during construction, as well as nearby settlements and agricultural lands adjacent to the RoW. It also encompasses environmentally sensitive features within proximity to the alignment, including agricultural wetlands such as Rugeramigozi, where indirect effects (e.g., sedimentation or disturbance) may occur despite the absence of tower placement. In addition, the AoI considers associated activities such as material storage, access roads, and potential worker presence, as well as cumulative effects linked to the existing Kigoma–Mt Kigali transmission network.

3.4 General Location Criteria

The selection of the transmission line corridor was guided by a set of technical and safety, environmental, and socio-economic considerations to ensure an optimal balance between engineering feasibility, environmental protection, and social acceptability. These criteria were applied during both the preliminary design and field verification stages.

a) Technical and Safety Criteria

- To adopt the most direct alignment between the starting and terminal points in order to minimize the total length of the line, reduce technical losses, and optimize construction and maintenance costs.
- To utilize existing linear infrastructure corridors (e.g., roads and existing power lines) to facilitate access for construction and maintenance activities while improving safety and reducing the need for new access routes.
- To avoid areas with rugged terrain and steep slopes where construction is technically challenging, access is difficult for machinery, and there is increased risk of erosion and structural instability.
- To avoid highly exposed topographic features such as hilltops and ridgelines where the infrastructure could be more vulnerable to environmental and safety risks.

b) Environmental Criteria

- To avoid environmentally sensitive areas such as wetlands, flood-prone zones, reforestation areas, and other ecologically important landscapes, and where unavoidable, to select the least sensitive sections to minimize impacts.
- To limit habitat disturbance and landscape fragmentation by aligning the corridor with existing land use patterns and natural landscape structures.

- To minimize potential erosion and land degradation by avoiding fragile soils and steep slopes.
- To reduce visual impacts by avoiding prominent or highly visible landscape features where possible.

c) Socio-Economic Criteria

- To avoid densely populated areas, villages, and zones with high concentrations of households in order to minimize resettlement, reduce compensation costs, and limit social disruption.
- To align the corridor in a way that minimizes the creation of residual or unusable land parcels, thereby preserving the usability of agricultural land.
- To follow administrative boundaries and land use interfaces where feasible, reducing conflicts over land use and improving acceptability among local communities.

In addition, **local optimization of the alignment was carried out during field surveys**, allowing further adjustments to avoid or minimize impacts on sensitive environmental features and socially constrained areas identified along the route.

3.5 Power Line

The width of the RoW must be at most 25 m for 110 kV lines, i.e. 12.5 m on each side of the centre line. The design was determined by the extreme sag of conductors due to maximum wind effect as well as the environmental limitations such as audible sounds, electric field and radio and TV interferences.

The clearance of the RoW where the line crosses forested areas, all trees/vegetation exceeding 5m of height will be cleared within the 25m of RoW. For the crops which do not grow taller and cannot reach 4 to 5 meters, only the clearance will be limited to area needed for stringing, visibility and workers movement in order to minimize forest disturbance and also to maximize harvesting in the RoW. Out of that strip, but within the RoW, all the vegetation higher than 5 meters must be cleared including trees with potential threat outside the RoW. Moreover, when the final positioning of towers is well done, it is a factor that may even reduce the need for clearing. Notwithstanding what is previously stated, crops that do not exceed 4 to 5 meters, particularly banana trees, will be authorized as well as livestock grazing or other compatible activities. That prescription will be maintained all along the operational life of the line.

Despite that, such an approach of maintenance aspects may be different from the methods in force among the operators, the experience of other projects in the region and internationally has shown that by engaging local communities present along the line for maintenance and safety of the line, those requirements regarding the line can be respected. That approach has also appeared to be efficient in order to reduce theft of metallic bracing and tower ground materials in addition to reducing maintenance costs related to vegetation control in the RoW. Such an agreement helps the users to maintain their activities (e.g., agriculture, livestock, plantations, etc.) on the condition that they do not interfere with the network operation.

The land acquisition will be limited to tower locations. Since agriculture is based on one plantation and one manual harvest a year, the production loss will be small. Despite the fact that the area of

tower base may reach 100 m² (10m x 10m), under normal circumstances, the lost area is limited to four concrete legs of the base, that is, in total 6.25 m² (2.5 m X 2.5 m). Generally, soils are excavated to a depth of 3.5 m maximum.

Storage space for building materials and equipment will be identified by the contractor, who will submit it to the client for approval. In addition, access roads will be constructed by the Contractor in charge of construction works for the lines. The location and the length of such roads being not known for the time being, only general impacts related to them are described here.

3.6 Line Characteristics

For the 110 kV lines, the feasibility study proposes the following technical design:

Table 9: Line characteristics

Description	Unit	Value/Parameters
Tower type: Terminal tower type MAT+0		Tension medium angle tower
Line angle	Degree	150° – 165°
Structural Steel according to Standard EN 10025	quality	S235/S355
Section of phase conductor	mm^2	ACSR 240/40
Horizontal Tension per phase ACSR 240/40 conductor at 0°C	daN	2500
Type and section of earth wire OPGW 97-AL3/48-A20SA,24G.652	mm^2	144.8
Horizontal tension foreseen of earth wire at 0°C (OPGW)	daN	1800
Number of phase conductors	Pce	6
Number of earth wire OPGW conductor	Pce	1
Rated voltage of the line Phase-Phase	kV	110
Minimum electrical clearance phase -phase	mm	1200
Minimum electrical clearance phase -earth/tower	mm	1200
Electrical clearance distance phase to phase vertical arrangement in mid-span	mm	4000
Electrical clearance distance phase to earth wire OPGW in mid-span	mm	2500
Spans to be considered for tower calculation		

Description	Unit	Value/Parameters
Line span	m	350
Wind span	m	350
Minimum height dimensions of the tower & foundation type		
Tower arrangement: Two (2) lowest cross-arms at the same level		Vertical arrangement
Total height to top above ground (earth wire point)	m	25.75
Total height to lowest cross arms above ground (conductor 1+2) attachment point)	m	17.25
Total height to highest cross arm above ground (conductor 3 attachment point)	m	21.75
Type of foundation (metallic grillage filled with at least 1600 daN/m3 density soil compacted to a minimum of 2,5 bars) in normal areas without water to be considered where soil bearing capacity is min.3 bars	set	Static calculation
Type of foundation in swampy area with water: steel reinforced concrete foundation type flat footing, class C25 to be considered where soil bearing capacity is approx. 0,5 bar	m3	55

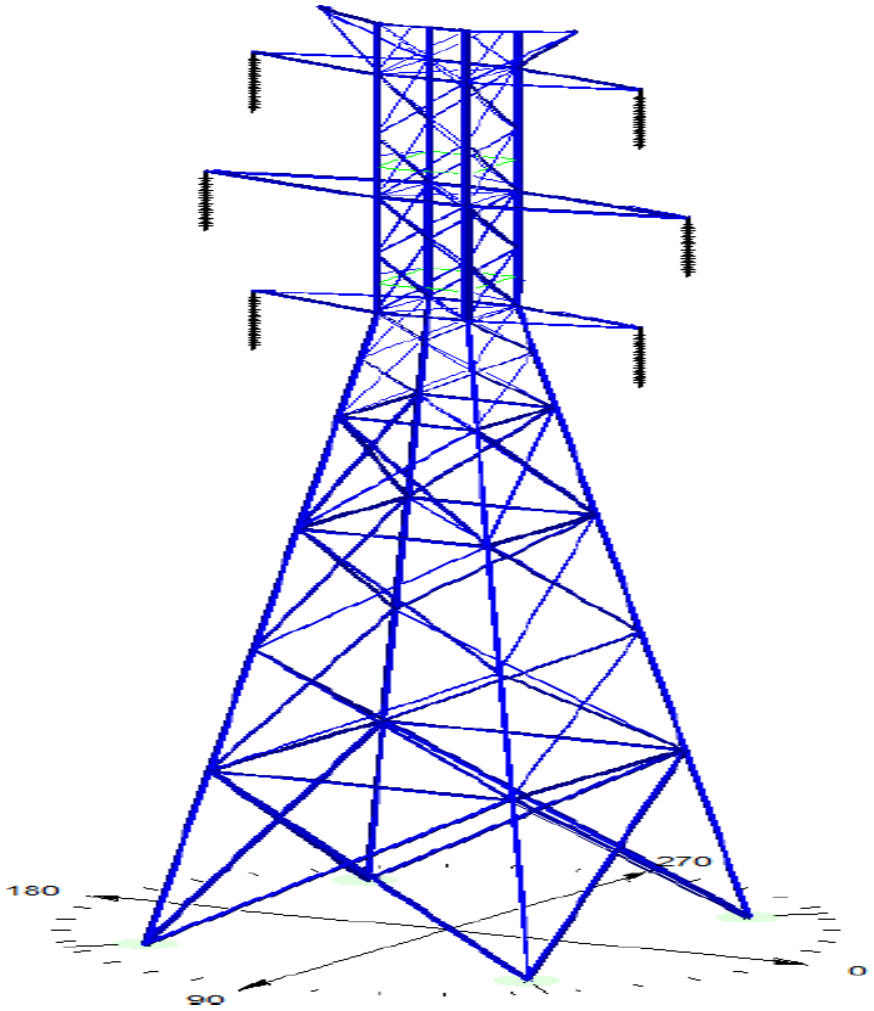

Figure 2: Schematic diagram of 110 kV double circuit tower

Each tower foundation is expected to require an excavation of approximately 27 m³ depending on soil conditions and soil tests results, with typical footing dimensions of 3 m wide, 3 m long and 3 m deep. Excavated material will be reused for backfilling where suitable, and excess spoil will be disposed of in approved locations (approved district dumping site) to prevent environmental degradation.

3.7 Operation and Maintenance

3.7.1 Right-of-way

The transmission line requires clearing a permanent RoW. Its width generally is 25 m wide for 110 kV Transmission lines.

Trees along the Right of Way (RoW) will be cleared in accordance with the required safety margin to ensure that conductors, even when displaced up to 45° from the vertical axis, do not come into contact with vegetation and cause short circuits, taking into account the expected annual growth of vegetation. To mitigate risks to people's property and livelihoods, clearing will be strictly limited to the defined RoW, and all affected assets (trees and crops) will be identified, valued, and compensated in line with national regulations and the World Bank ESF prior to removal. In

addition, selective clearing will be applied to retain low-growing vegetation compatible with safety requirements, allowing continued agricultural use of the land, while livelihood restoration measures and continuous stakeholder engagement will be implemented to minimize income loss and ensure sustainable land use within the corridor.

The regular maintenance of the RoW will be done in order to maintain clearance as described above, among towers, conductors and all the vegetation or structures. An access road of 5 m width will also be maintained where necessary. Those maintenance operations will normally take place twice a year but may vary according to local conditions and the contractors' planning.

3.8 Preliminary Schedule and Project Costs

Based on the consultant's experience in similar projects, the construction should start after the contract signing that follows an international invitation to tender. Preconstruction activities include a geological investigation, a detailed survey of the line as well as an update of the inventory of property of the People Affected by the Project (PAP), the payment of compensation and reinstallation. Then it is expected to take at least one year to start construction activities (Site preparation, construction of storage facilities and other temporary buildings, the establishment of water and power supply systems as well as communication facilities on construction sites).

The construction will start with tower foundations followed by their erection and conductors' installation. The construction is expected to spread over 24 months after contract award to contractors and consultants. The project cost is USD 6,250,933.93 and the contractor is STEG-IS.

Chapter IV: Description of the Current Project Environment (Baseline State)

The description of the Current Project Environment or Baseline State provides the context from which to consider the environmental and social impacts of the proposed project. The baseline characteristics described include both environmental (climate, topography, hydrology, geology, soils, biodiversity, ecosystems, etc.) and social indicators (income, poverty, gender issues, literacy, health care, etc). The baseline assessment is presented for each of the project area.

4.1 Environmental Baseline for the 110 kV Double Circuit Cut-in Cut-out Transmission Line Kigoma SS – Mt Kigali SS (21 km)

4.1.1 Ruhango District: Biophysical Baseline

4.1.1.1 Climate and Air Quality

The project area is located in the Southern Province of Rwanda, specifically within Muhanga and Ruhango Districts, characterized by an equatorial highland climate moderated by altitude, with two rainy seasons (March–May and September–December) and two dry seasons (June–August and January–February). Average annual rainfall ranges between 1,000 mm and 1,300 mm, while temperatures vary between 14°C and 27°C (source: Rwanda Meteorology Agency). Air quality in the project area is generally good, particularly in rural areas along the transmission line corridor, with no significant industrial emission sources. Localized pollution is mainly associated with vehicular emissions, dust from unpaved roads, and biomass use (wood and charcoal) at household level.

For the purpose of this ESIA, air quality assessment is referenced against both national standards and international guidelines, particularly those of the World Health Organization (2021). The key parameters considered include:

- **PM2.5 (fine particulate matter):** WHO guideline – 15 µg/m³ (24-hour), 5 µg/m³ (annual)
- **PM10 (coarse particulate matter):** WHO guideline – 45 µg/m³ (24-hour), 15 µg/m³ (annual)
- **NO_2 (Nitrogen Dioxide):** WHO guideline – 25 µg/m³ (24-hour), 10 µg/m³ (annual)
- **SO_2 (Sulfur Dioxide):** WHO guideline – 40 µg/m³ (24-hour)
- **CO (Carbon Monoxide):** WHO guideline – 4 mg/m³ (24-hour)

Rwanda's ambient air quality standards, as established under national environmental regulations, are generally aligned with these international benchmarks and are applied alongside them in assessing project impacts. Baseline observations indicate that pollutant levels are typically within acceptable limits, with only short-term and localized increases expected during construction, which will be mitigated through standard dust and emission control measures.

4.1.1.2 Topography and Hydrology

The project area, located in Muhanga and Ruhango Districts, is characterized by undulating terrain typical of Rwanda's Central Plateau, with a succession of hills and valleys forming localized watersheds. Surface water from the project area drains mainly toward the Akanyaru River, a

tributary of the Nyabarongo River system. This topographic setting influences drainage patterns, soil stability, and land use, particularly in agricultural areas and valley bottoms including wetlands.

In relation to the proposed transmission line, these conditions present potential environmental risks, particularly during the construction phase. Excavation works for tower foundations on sloped terrain may increase the risk of soil erosion and sediment runoff, potentially affecting nearby watercourses and wetlands. Disturbance of riparian vegetation during access creation or material transport may also reduce natural protection against erosion and affect aquatic habitats. In addition, accidental spills of fuels or lubricants from construction machinery could lead to localized water pollution, impacting water quality and aquatic biodiversity. Although no towers will be installed within wetlands or riverbanks, indirect impacts such as sedimentation, alteration of natural drainage, and minor disturbance to aquatic and riverbank ecosystems may occur if not properly managed. There is also a limited risk of localized flooding or water flow obstruction if construction activities interfere with natural drainage channels.To address these risks, the project will apply appropriate mitigation measures, including careful siting of towers outside watercourses, erosion control measures on slopes, protection of riparian buffers, proper waste and fuel management, and restoration of disturbed areas. These measures will ensure that impacts on hydrology, soil stability, and aquatic ecosystems are minimized and remain within acceptable limits.





Figure 3: Mwogo River in Ruhango District

Figure 4: Water course draining Nyamugafi wetland

4.1.1.3 Wetland Characterization in Ruhango District

The majority of wetlands traversed by the proposed transmission line are located in Ruhango District, where five main wetlands have been identified along the corridor: Gasenyi–Rwamikara, Kamugongo–Bakoni–Kamonyi (Gahengeri and Kirengeri cells), Nyabikone (Muhororo and Mpanda cells), Nyamugafi (Muhororo and Mpanda cells), and Urugondo (Kamonyi village, Kirengeri cell). These wetlands are highly modified and intensively used for agriculture, with dominant crops including maize, beans, cassava, colocasia (taro), sweet potatoes, and limited sugarcane and banana plantations. Vegetation within these wetlands reflects strong anthropogenic influence, with Pennisetum purpureum (elephant grass) widely used for erosion control and soil

stabilization, while Eucalyptus spp. are commonly planted along wetland fringes. In relatively wetter and less intensively cultivated patches, particularly in Urugondo wetland, Pennisetum clandestinum (kikuyu grass) dominates uncultivated areas, indicating high soil moisture conditions.

Ecologically, these wetlands are degraded agro-ecosystems with limited natural habitat value. Field surveys conducted along the transmission line corridor, combined with a review of the Ministerial Order No. 007/2008, confirm that no protected plant or animal species are present within these wetlands. Avifauna observed include common and widespread species such as the Pied Crow (*Corvus albus*), Cattle Egret (*Bubulcus ibis*), Sacred Ibis (*Threskiornis aethiopicus*), Grey-headed Sparrow (*Passer griseus*), and Long-crested Eagle (*Lophaetus occipitalis*), all classified as *Least Concern* under the IUCN Red List of Threatened Species. Other fauna include common amphibians such as *Xenopus laevis* (African clawed frog) and *Amietophrynus regularis* (African common toad), as well as reptiles like *Philothamnus semivariegatus* (spotted bush snake) and *Psammophis sibilans* (sand snake). Overall, the wetlands in Ruhango District provide limited ecological sensitivity but important socio-economic value for local agriculture, and their condition reflects long-term human use rather than natural wetland ecosystems.



Figure 5: Modified Nyabikone wetland (Muhororo and Mpanda cells of Byimana sector)

4.1.1.4 Geology and Soils

The rock substrate of this region belongs to the Karagwe – Ankole system, 1,400 – 1,000 million years old. It is made of clay stones, shales and phyllites, limestones and quartzites. Some late Proterozoic intrusive rocks produce small inselbergs. Remnant of the extensive lateritic formations dating from the Tertiary cover large areas of the eastern plateaus. Ruhango District has very fertile soils in almost all its sectors. Most of the soils are loamy and few others are sandy with loam

mixture. In some boggy areas, clay soil may be found. In both districts the soil type is a mixture of sandy–clay soil.

In relation to the project, these geological and soil characteristics are important for tower siting, foundation design, and access road construction. The predominance of loamy and sandy–clay soils generally provides adequate bearing capacity for tower foundations, although site-specific geotechnical investigations will be required to confirm soil stability and determine appropriate foundation types and depths. In areas with clayey or waterlogged soils (e.g., boggy zones and near wetlands), there may be risks of reduced load-bearing capacity and increased susceptibility to settlement, requiring adapted foundation designs and careful siting to ensure structural stability. Additionally, the presence of lateritic formations and sloping terrain may increase the risk of erosion during excavation and access road development, necessitating the implementation of proper drainage and soil stabilization measures during construction.

4.1.1.5 Flora (Vegetation)

The natural vegetation in the project site is wood / forest savanna type, with predominance of acacia trees. However, this natural vegetation which was historically very dense and covering the flattened hills, is now tending to disappear completely, due to human pressure for agricultural fields, and to be replaced by crop fields and forest plantations, by the District and private individuals. Very little remaining natural vegetation cover of conservation importance remains, due to extensive human activities. Generally, there is no important conservation areas or species recorded along the proposed power line route.

The absence of important conservation areas or species along the proposed transmission line route was confirmed through a combination of field surveys and review of secondary data sources. The Consultant conducted walk-through field inspections along the entire project corridor, including key habitat types such as agricultural land and wetlands, to identify any ecologically sensitive areas or notable species. This was complemented by a literature review of available national biodiversity reports, land use maps, and environmental databases, which did not indicate the presence of protected areas, critical habitats, or threatened species within the project footprint. The findings from both field observations and desk-based review consistently indicate that the project area is largely composed of modified habitats with low ecological sensitivity.

Table 10: Crop fields crossed by the Kigoma–Muhanga transmission line in Ruhango District

District	Vegetation Type	Expected (Ha)	Percentage of District RoW	Total (Ha)
Ruhango	Mixed Crops (beans, maize, sorghum)	12.635	37.50%	33.688
	Banana plantation	2.448	7.26%	33.688
	Forest	7.084	21.02%	33.688
	Grassland	2.880	8.56%	33.688
	Tea and coffee plantation	8.641	25.65%	33.688
Total		**33.688**	**100.00%**	**33.688**

Source: Field survey, 2025

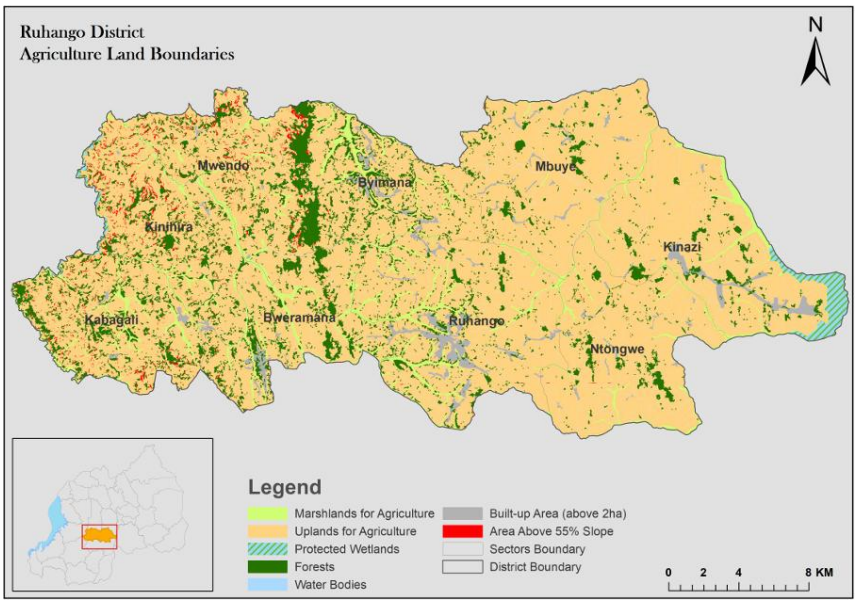

Figure 6: Land Vegetation Cover in Ruhango District

Source: ATLAS OF RWANDA Agriculture Land Boundaries



Figure 7: Flora in the project area dominated with banana, maize and cassava in Ruhango District

4.1.1.6 Fauna (Wildlife)

Despite the strong anthropization[2] of the environment, wildlife still exists along the route of the power lines, as indicated in the table below.

[2] the transformation of natural environments by human activity, such as agriculture, urbanization, deforestation, or industrial development.

Table 11: Encountered wildlife along the Kigoma-Muhanga Transmission Line

District	Observed fauna types in the project area			
	Mammal	**Bird**	**Amphibian/ Reptile**	**Fish**
Ruhango	Mice, Jackals, Bats	Black Eagles, Grey-headed Sparrow, Village Indigobird, Tropical Boubou, Tambourine Dove, African Paradise, Black-headed Heron	chameleon, gecko, a variety of frogs (*Ptychadena* spp.), reed frogs (*Hyperolius* spp.), a variety of snakes (e.g., *Philothamnus spp.*, *Boaedon capensis*, *Python sebae*)	No fish

During the field surveys, the encountered wildlife species along the proposed power line are common species, no species of particular conservation status and in particular no Papyrus Gonolek was spotted in the area. The absence of Papyrus Gonolek in the project area was confirmed through a combination of field surveys and literature review. Field observations were conducted along the entire transmission line corridor, including wetland sections, using visual encounter surveys and opportunistic bird observations during peak activity periods (morning and late afternoon). These were complemented by a review of available secondary data, including national biodiversity records, bird distribution data, and existing studies from conservation organizations (e.g., IUCN and Rwanda Biodiversity Information System). This was done in the project area and within a 500 m buffer around it.

Sensitive Habitats:

The wetland systems traversed by the proposed transmission line project are highly modified and degraded, having been extensively converted into agricultural land. Field observations and supporting literature confirm that these wetlands are predominantly cultivated with crops such as maize, beans, cassava, potatoes, and taro, with little to no presence of natural papyrus-dominated vegetation. Instead, vegetation within and around the wetlands is characterized by managed and opportunistic species, including grasses such as *Pennisetum purpureum* (elephant grass) and *Pennisetum clandestinum* (Kikuyu grass), which are widely used for soil stabilization and fodder. The wetland fringes are largely occupied by agroforestry systems dominated by *Eucalyptus spp.* and *Grevillea robusta*, along with scattered fruit trees (e.g., avocado, mango, guava, and citrus), reflecting intensive human use of the landscape (appendix 6 and 7). As a result, the natural riparian vegetation structure is largely absent, and the ecological functions of these wetlands are significantly altered, with limited habitat value for specialized wetland species. The overall observation is that all wetlands within the transmission line corridor and its 500 m buffer have been significantly degraded and fully transformed by human activities, mainly agriculture and brick-making. Consequently, no intact or undisturbed wetland habitats remain, and the original natural vegetation has been almost entirely replaced by modified land uses. This was confirmed through systematic field surveys conducted along the entire 21 km corridor, complemented by GIS analysis and interpretation of recent satellite imagery, as well as ground-truthing of wetland sections to verify land use and habitat conditions on site.



Figure 8: Nyamugafi wetland, Muhororo and Mpanda cells of Byimana Sector, Ruhango District

As planned, no tower will be constructed in the wetland or in its buffer as defined by Law N°48/2018 of 13/08/2018 on Environment, which states that it is prohibited to build in the swamp and in the buffer zone within twenty metres (20 m) of the swamp boundaries.

4.1.1.7 Land Use in Project Area

A total of 52.5 ha will be affected by the 21km long Kigoma-Muhanga SS transmission line. These are currently used for agricultural purposes, of different crop types as illustrated in the following table:

Table 12: Main Crop Types within the Affected 52.5 ha Project Area

Crop Category	Main Crops Observed / Expected	Estimated Share of Affected Area (%)	Description of Land Use Pattern
Cereals	Maize, Sorghum	25–30%	Dominant in valley bottoms and gently sloping areas, as confirmed during field visits (see figure 7 showing mature maize fields). Maize is widely cultivated in Rwanda and performs well in loamy soils.

Crop Category	Main Crops Observed / Expected	Estimated Share of Affected Area (%)	Description of Land Use Pattern
Legumes	Beans (climbing and bush beans)	15–20%	Commonly intercropped with maize and banana plantations; widely practiced in Muhanga District where climbing beans are a key crop.
Perennial Crops	Banana plantations	20–25%	One of the most dominant crops in Muhanga, often grown in mixed farming systems and around homesteads.
Root and Tuber Crops	Cassava, Sweet potatoes	10–15%	Cultivated in both upland and lowland areas; important for food security and widely distributed across the project area.
Cash Crops	Coffee (smallholder plantations)	5–10%	Present in scattered plots, particularly on hillsides; contributes to household income.
Vegetables and Others	Vegetables (e.g., cabbage, tomatoes), small garden crops	5–10%	Found mainly in wetlands and near water sources; typically small-scale subsistence production.

The crop distribution is based on field observations along the transmission line corridor, including visual confirmation of maize-dominated fields (as shown in the photo), combined with district-level agricultural profiles and national statistics, which indicate that banana, beans, cassava, and maize are among the most dominant crops in Rwanda and specifically in Muhanga District.

Table 13: Main Tree Types within the Affected Project Area (52.5 ha)

Tree Category	Main Species Observed / Expected	Estimated Presence (%)	Description of Distribution
Exotic Forestry Trees	*Eucalyptus spp.*, *Pinus spp.*, *Calliandra calothyrsus*	40–50%	Dominant in woodlots and farm boundaries for fuelwood, poles, and soil improvement (especially Calliandra for agroforestry and fodder). Widely planted across hillsides.

Tree Category	Main Species Observed / Expected	Estimated Presence (%)	Description of Distribution
Agroforestry Trees	*Grevillea robusta*, *Markhamia lutea*, *Leucaena leucocephala*	20–30%	Scattered within croplands (maize, beans, banana systems); used for shade, soil fertility improvement, and erosion control.
Fruit Trees	Avocado (*Persea americana*), Mango (*Mangifera indica*), Papaya (*Carica papaya*), Citrus spp. (orange, lemon), Jackfruit (*Artocarpus heterophyllus*)	15–20%	Mainly around homesteads and small farms; important for household consumption and local markets.
Indigenous / Mixed Trees	*Ficus spp.*, *Albizia spp.*, *Vernonia amygdalina*, *Dracaena afromontana*	<1–3%	Occur sparsely along field boundaries, near watercourses, and in remnant vegetation patches; limited due to long-term land conversion.
Shrubs and Hedgerows	*Tithonia diversifolia*, *Erythrina abyssinica*, live fences	<1–2%	Common along plot boundaries and terraces; used for soil stabilization, green manure, and fencing.

This distribution is based on field observations along the transmission line corridor, complemented by typical agroforestry and rural land-use practices in Muhanga and Ruhango District. The dominance of eucalyptus woodlots and grevillea-based agroforestry systems reflects intensive land use and high population pressure, while indigenous species are limited to scattered occurrences due to long-term agricultural transformation.

4.1.2 Muhanga District: Biophysical Baseline

The assessment of biodiversity and land use conditions in Muhanga District was conducted to establish the baseline ecological characteristics, level of habitat transformation, and potential areas of impact associated with the proposed 110 kV transmission line corridor. The study covered the entire 21 km transmission line alignment, including a buffer zone of 500 m on either side of the Right of Way (RoW), to capture both direct and indirect impact areas in line with ESIA good practice.

The study approach combined field surveys and desk-based review. Fieldwork involved systematic walk-through surveys along the alignment, visual observation of flora and fauna, and ground-truthing of key land use types, including agricultural fields, wetlands, and settlement areas. These observations were complemented by a review of secondary data sources, including district land use plans, national biodiversity references, and satellite imagery analysis using GIS tools to verify land cover and habitat conditions.

Findings indicate that the project area in Muhanga District is highly modified, with land predominantly under intensive agriculture (maize, beans, banana) and agroforestry systems (eucalyptus and grevillea). Wetlands encountered within the corridor and buffer zone are fully degraded and converted for agriculture and brick-making, with no intact natural habitats or protected areas identified. Consequently, the ecological sensitivity of the area is considered low, with biodiversity largely limited to common and adaptable species associated with human-modified landscapes.

In terms of areas of impact, the project will directly affect the Right of Way (25 m width) and tower footprint locations, mainly through vegetation clearing and minor habitat disturbance. Indirect impacts may extend into the surrounding buffer through temporary disturbance (noise, human activity) during construction, though these are expected to be localized and reversible. No critical habitats, legally protected areas, or species of conservation concern were identified within the study area.

Overall, the findings are supported by field survey data, GIS-based land cover analysis, and available national environmental and biodiversity information, providing a reliable basis for impact assessment and mitigation planning.

This power line project comprises 21 kilometers 110 kV double circuit line connecting Kigoma–Mt Kigali Transmission line to the new Muhanga substation in Muhanga District. The project crosses 2 districts, Ruhango and Muhanga. This section will focus on Muhanga District.

4.1.2.1 Climate and Air Quality

The project area has a tropical highland climate with two rainy (March–May, September–December) and two dry seasons (June–August, January–February). Annual rainfall ranges from 1,200–1,600 mm, temperatures average 18–22°C, and humidity is generally high. Wind patterns are influenced by local topography, with generally low wind speeds. Air quality in the project area is currently good, with limited pollution mainly from dust, biomass burning, farming practices, and localized vehicular emissions, and no major industrial sources identified.

In terms of regulatory standards, Rwanda follows national environmental regulations aligned with international good practice. Key air quality parameters and limits are summarized below for comparison with World Health Organization (WHO) guidelines:

- **Particulate Matter ($PM_{2.5}$):** Rwanda standard ≈ 25 µg/m³ (24-hour); WHO guideline: 15 µg/m³ (24-hour)
- **Particulate Matter (PM_{10}):** Rwanda standard ≈ 50 µg/m³ (24-hour); WHO guideline: 45 µg/m³ (24-hour)
- **Nitrogen Dioxide (NO_2):** Rwanda standard ≈ 200 µg/m³ (1-hour); WHO guideline: 200 µg/m³ (1-hour)
- **Sulfur Dioxide (SO_2):** Rwanda standard ≈ 125 µg/m³ (24-hour); WHO guideline: 40 µg/m³ (24-hour)
- **Carbon Monoxide (CO):** Rwanda standard ≈ 10 mg/m³ (8-hour); WHO guideline: 10 mg/m³ (8-hour)

These standards indicate that while Rwanda's limits are generally consistent with international practice, WHO guidelines are more stringent for certain pollutants (especially $PM_{2.5}$ and SO_2). Given the absence of major emission sources, baseline air quality in the project area is expected to be within acceptable limits, with potential temporary impacts limited to the construction phase.

4.1.2.2 Topography and Hydrology

The project area is characterized by undulating hills and valleys of the central plateau, with elevations ranging from about 1,300 m in river valleys to over 1,800 m on hilltops. Slopes are generally moderate to steep, influencing land use and erosion risks, while flat terrain is confined to valley bottoms and wetlands. The area is drained by permanent rivers and seasonal streams forming part of the Nile–Congo basin divide, with wetlands and marshes serving as vital catchments and groundwater recharge zones. Groundwater is accessed through shallow wells and boreholes with moderate yields. Seasonal flooding may occur in poorly drained valleys, though overall water quality remains good, with localized risks of pollution from agriculture and household waste.



Figure 9: Nyabarongo river in Rongi sector of Muhanga District

4.1.2.3 Wetland Characterization in Muhanga District

Only one wetland, Rugeramigozi, is traversed by the transmission line in Muhanga District, specifically in Nyamabuye Sector (Gahogo Cell). This wetland is the largest among those crossed by the project and is strategically located adjacent to the Muhanga Industrial Park, separated by a paved road, and intersected by the national road corridor National Road NR1. Similar to the wetlands in Ruhango, Rugeramigozi is fully transformed into an agricultural landscape, dominated by seasonal and perennial crops such as maize, beans, cassava, colocasia, and banana plantations. Soil protection measures are evident through the use of Pennisetum purpureum, while eucalyptus trees line the wetland boundaries.

Field investigations confirm that no undisturbed wetland habitat remains within the project corridor or within a 500 m buffer, and no protected species listed under national legislation are present. Bird species observed are similar to those in Ruhango wetlands, with slightly higher abundance due to the larger size of the wetland, but still dominated by common species classified as *Least Concern* under the IUCN Red List. Additional fauna include typical agricultural landscape species such as *Agama agama* (common agama lizard), amphibians like *Hoplobatrachus occipitalis* (crowned bullfrog), and non-venomous snake species adapted to disturbed habitats. The combined use of field surveys and secondary data review confirms that Rugeramigozi wetland has low ecological sensitivity but high socio-economic importance, particularly for agriculture and local livelihoods. The project design—specifically the placement of towers outside wetland areas and spanning crossings—further minimizes direct impacts on this already modified ecosystem.



Figure 10: Rugeramigozi wetland in Nyamabuye sector of Muhanga District

4.1.2.4 Wetland Ecosystem Functions

The wetlands traversed by the transmission line currently provide limited ecological functions due to long-term anthropogenic degradation. Their primary functions include seasonal water retention, small-scale flood regulation, soil moisture conservation, and support for subsistence agriculture. Ecological functions such as biodiversity habitat provision and nutrient cycling are significantly reduced compared to natural wetland systems. The dominance of monoculture crops and absence of native vegetation (e.g., papyrus) further limits habitat value.

4.1.2.5 Geology and Soils

The area is underlain by stable Precambrian rocks (schists, quartzites, granites), with weathering processes producing deep, agriculturally productive soils. Dominant soil types include ferralsols and laterites, generally fertile but erosion-prone on steep slopes, while valley bottoms contain alluvial soils suitable for irrigation. Soil depth ranges from shallow on hilltops to deep in valleys,

with overall stability favorable for construction, though erosion control is needed in cultivated and sloping areas.

4.1.2.6 Vegetation

Vegetation in the project area has been heavily altered by agriculture, with most natural forests replaced by secondary growth, woodlots, agroforestry systems, and plantations of eucalyptus and pine. Common species include Grevillea robusta, Eucalyptus spp., and Albizia spp., often intercropped with bananas, coffee, and food crops, while grasslands are dominated by elephant grass. Although no critical habitats or large intact forests remain, existing vegetation and riparian zones provide essential ecosystem services such as erosion control, fuelwood, construction materials, water regulation, and biodiversity support.

Table 14: Vegetation crossed by the line in the district

District	Vegetation Type	Expected (Ha)	Percentage of District RoW	Total (Ha)
Muhanga	Banana	1.527	8.68%	17.592
	Forest	6.205	35.30%	17.592
	Coffee	1.988	11.31%	17.592
	Others	7.872	44.71%	17.592
Total		**17.592**	**100.00%**	**17.592**

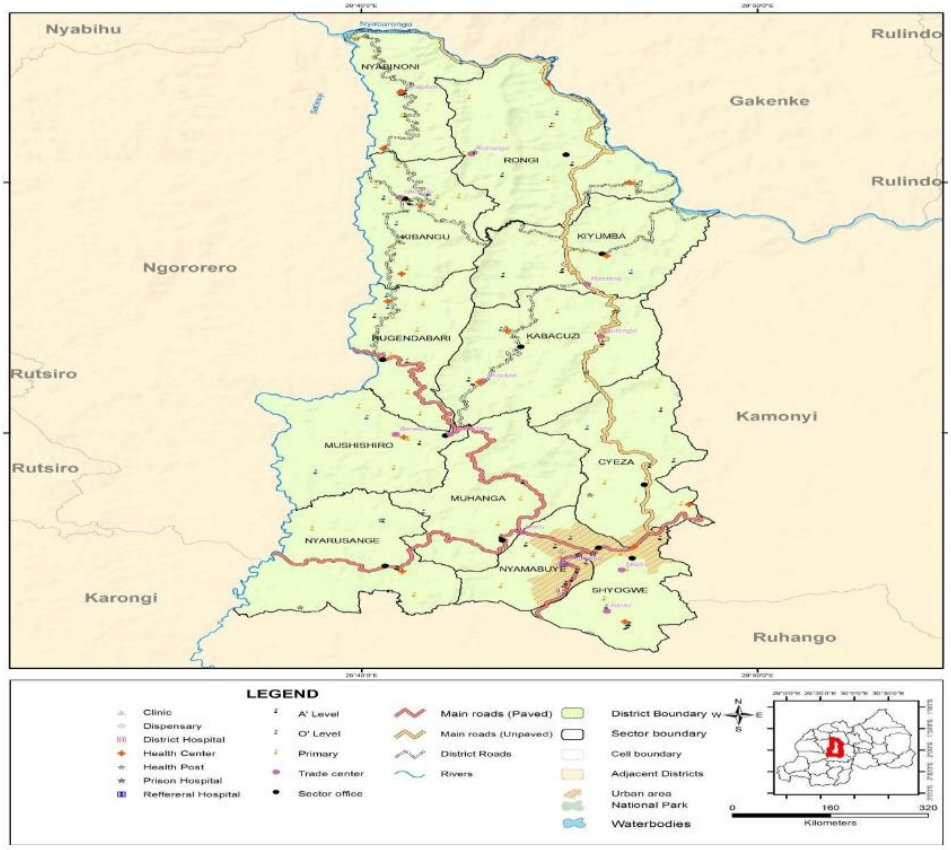

Figure 11: Administrative Map of Muhanga District

4.1.2.7 Fauna (Wildlife)

The Muhanga section of the transmission line corridor is characterized by a highly modified environment, dominated by intensive agriculture, peri-urban settlements, and infrastructure development, including its alignment along the boundary of the Muhanga Industrial Park. The corridor traverses parts of the Rugeramigozi wetland, which is fully degraded and converted into year-round maize cultivation, with no remaining natural papyrus or undisturbed wetland habitat. As a result, the area provides limited ecological value for wildlife, and fauna presence is largely restricted to species that are adaptable to human-altered landscapes.

The fauna recorded and expected in this section is therefore composed mainly of common and resilient species, including small mammals (e.g., rodents), reptiles (such as geckos and non-venomous snakes), amphibians (mainly frogs associated with seasonal water presence), and a variety of generalist bird species commonly found in agricultural and urban environments. Birdlife is typically limited to species adapted to open fields and human activity, with no evidence of wetland-specialist or conservation-sensitive species, due to the absence of suitable habitat conditions.

This characterization is based on field observations conducted along the transmission line corridor, including visual encounter surveys and opportunistic sightings, as well as review of available biodiversity information for the area. No protected species, critical habitats, or wildlife corridors were identified within the Muhanga section.

Given the already degraded and urban-influenced nature of the area, potential impacts on fauna are expected to be low and mostly limited to temporary disturbance during construction, such as noise, vibration, and human presence. These impacts are reversible and will be mitigated through good construction practices. Overall, the Muhanga section is considered to have low faunal sensitivity in the context of the project.

Table 15: Encountered Wildlife along the Kigoma–Muhanga Transmission Line in Muhanga District

Fauna Group	Common Name	Scientific Name (where applicable)	Habitat Type	Observation Status
Birds	Cattle Egret	*Bubulcus ibis*	Agricultural fields, wetlands	Frequently observed
Birds	Pied Crow	*Corvus albus*	Open fields, peri-urban areas	Frequently observed
Birds	Village Weaver	*Ploceus cucullatus*	Farmlands, settlements	Common
Birds	Speckled Mousebird	*Colius striatus*	Shrublands, agroforestry areas	Occasional
Mammals	Rodents (rats, mice)	*Rattus spp.*, *Mus spp.*	Croplands, settlements	Common (indirect signs)

Fauna Group	Common Name	Scientific Name (where applicable)	Habitat Type	Observation Status
Reptiles	House Gecko	*Hemidactylus spp.*	Buildings, trees	Common
Reptiles	Skinks	*Trachylepis spp.*	Farmlands, grasslands	Occasional
Reptiles	Snakes (non-venomous species)	e.g., *Lamprophis spp.*	Agricultural areas	Rare / occasional
Amphibians	Common Frogs	*Ptychadena spp.*	Wetlands, seasonal water areas	Occasional

4.2 Socio-economic Baseline Data

4.2.1 Social Risks, Community Health and Safety, and Labor-Related Issues

Given that the project involves the construction of a 110 kV transmission line crossing **peri-urban and rural areas in Muhanga and Ruhango District**, including proximity to settlements and the Muhanga Industrial Park, several social risks have been identified.

4.2.1.1 Community Health and Safety Risks

Construction activities may expose nearby communities to **safety hazards**, including risks from movement of construction vehicles, excavation works, and installation of towers and conductors. There is also a risk of **electrocution and accidents** during the operation phase if safety distances and awareness are not properly maintained. Temporary impacts such as **dust, noise, and restricted access to farmland or local paths** may affect community well-being. In addition, poor waste management or fuel handling could pose localized environmental health risks.

4.2.1.2 Labor Influx and Social Interaction Risks

Although the project is expected to prioritize **local labor recruitment**, the presence of external workers may still occur and could lead to **increased pressure on local resources and services**, as well as potential **social tensions** between workers and host communities. This situation may increase the risk of **communicable diseases**, including HIV/AIDS and other sexually transmitted infections, particularly in areas with limited awareness and health services.

Gender-Based Violence (GBV), Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH):
The project may present risks related to **GBV/SEA/SH**, especially due to interactions between workers and local communities, including vulnerable groups such as women and girls. These risks are often associated with **power imbalances, economic vulnerability, and labor influx**, even at a moderate scale. Without appropriate mitigation, there is a potential for **exploitative relationships, harassment, or abuse**.

4.2.1.3 Labor and Working Conditions Risks

Workers engaged in construction and maintenance activities may face **occupational health and safety (OHS) risks**, including accidents during excavation, working at heights, and handling of electrical equipment. There are also risks related to **non-compliance with labor standards**, such as inadequate working conditions, lack of proper contracts, or potential use of informal labor. Additionally, risks of **child labor and forced labor**, although not expected, must be proactively addressed in line with national legislation and international standards.

Vulnerable Groups

Certain groups within the project area, including **female-headed households, elderly persons, and economically vulnerable individuals**, may be disproportionately affected by project activities, particularly in terms of access restrictions, exposure to risks, and ability to benefit from project opportunities.

Overall, these risks are considered **moderate and manageable**, given the nature and scale of the project, and will be addressed through the implementation of **targeted mitigation measures**, including a **Health and Safety Plan, Labor Management Procedures (LMP), GBV Action Plan, and community awareness programs**, as detailed in subsequent sections of this ESIA.

4.2.2 General Conditions of the PAPs

The total number of Project Affected Persons (PAPs) for the proposed 110 kV transmission line between Ruhango and Muhanga Districts is estimated at 3,347 individuals, grouped into 797 households. Among these, 32 households are identified as vulnerable, based on criteria including disability, chronic illness, extreme poverty, and old age. A total of 64 households will experience permanent loss of a portion of their land, amounting to 1.8 hectares, where transmission towers will be installed. The socio-economic profile of the affected persons and households will be detailed in the socio-economic part of the RAP to be prepared for the project.

Among the household representatives surveyed, male respondents constituted 66%, while female respondents accounted for 34%. The average household size is 4.1, slightly below the national average of 4.3 persons per household. The survey revealed that 68.5% of household members fall within the active working-age group (19–65 years), and over 87% of respondents reported having attended at least primary school.

Regarding vulnerable households, the census identified that 4.0% (32 out of 797 households) fall within this category. Among the vulnerable, 8 individuals (25%) are living with disabilities, 7 (21.9%) are chronically ill, 9 (28.1%) are classified as poor based on the national Ubudehe categories, and 8 (25%) are elderly persons with limited self-support capacity.

In terms of property ownership, 59.7% of the affected assets are owned by the PAPs themselves, with the remainder either leased or occupied under informal arrangements. The occupational profile of the affected household heads indicates that 52.4% rely primarily on agriculture, 5.2% are salaried employees, and 19.3% are self-employed in small businesses or informal trades.

Concerning energy access, 73.8% of surveyed households use electricity as their main source of lighting, while 13.5% rely on kerosene lamps, and the remaining 12.7% use alternative sources such as batteries, firewood, or solar. For water access, 46.5% of households have piped water

directly in their homes or yards, whereas 53.5% fetch water from public taps, fountains, or communal standpipes. Regarding water billing, 80.6% reported paying monthly water bills between 1,000 and 5,000 RWF, and 19.4% paid more than 10,000 RWF.

In terms of compensation preferences, an overwhelming 98.9% of PAPs preferred to receive compensation in cash, allowing them the flexibility to replace or improve their assets independently, while the remaining 1.1% did not express a preference or were undecided at the time of the survey.

4.2.3 Magnitude of the Expected Loss

4.2.3.1 Magnitude of Expected Loss According to the Area of Affected Land

The magnitude of the expected loss was calculated based on the below criteria:

- Those who lose land and structure/fences of less than 10% of their lands will be slightly affected.
- Those who lose the land and structure/fences of around 25-30% of their lands will be moderately affected.
- Those who will lose the land and other structures/fences of around 95% of their lands will be severely affected.

The magnitude of expected loss will be permanent loss of land and structures where some of the landowners will permanently lose his/her land. However, s/he retains the right to benefit from the salvage of construction materials by selling them or moving them to any other preferred locations without deduction from compensation. Moreover, s/he will receive full compensation as per national law and WB ESF land acquisition requirements.

The construction will be 24 months, and the property owners will be compensated before the works commence on the respective plot. Survey has shown that no land will be fully affected. All Households owning the land in the RoW will still maintain some portion of the land that will not be affected outside the RoW, plus, the land that will be affected is purely agriculture, and people will continue to cultivate the land after the project activities with the restriction of not planting trees or crops that can grow to more than five meters height. Only the land for tower location will be acquired permanently. Therefore, the project will leave nobody landless and with compensation money, households will be able to immediately restore their livelihoods either by buying replacement land or by investing in other activities.

- EDCL/RUEAP will allow them to salvage the materials and crops before construction activities.
- EDCL/RUEAP will pay them the full compensation of the whole affected land and other structures, or any assets located on the affected land.
- The owner's approval should be attained first, thereafter, the landowner is invited to be consulted with regarding the compensation process in compliance with the expropriation law in public interests.

4.2.4 Socio-economic Baseline for Ruhango District

Ruhango is one of the eight Districts of the Southern Province of Rwanda. It covers a total surface area of 626.8 km² and is composed of 9 Sectors (Bweramana, Byimana, Kabagali, Kinazi, Kinihira, Mbuye, Mwendo, Ntongwe and Ruhango). According to the Fifth Population and Housing Census (NISR, 2022), the district has a resident population of 359,121 people, of whom 172,096 are male (47.9%) and 187,025 are female (52.1%), living in 94,508 private households with an average size of 3.8 persons per household.



Figure 12: Rural Settlements in Ruhango District

The rural area of Ruhango District is made up Rural settlement which is mainly small and dispersed community, but in some instances, we can find the densely populated settlements. It is characterized by moderate population density and a predominance of agricultural or natural landscapes. The houses are spread out, with farms, fields and forests surrounding the residential areas.

4.2.4.1 Economic Activities

The district is at the 17th position in the country to have a percentage of Households involved in agriculture and livestock activities. Crop farming and livestock rearing are the district's economy's backbones whereby 77.8% of the population depend on agriculture against 72% for national average (EICV5 2021). According to EICV5 72.3% of the HH of the district have less than 1ha of land to be cultivated.

4.2.4.2 Road Network

The District of Ruhango road network is to be improved and upgraded to facilitate inter-districts and cross border trade. Rural transport networks for rural and urban accessibility shall be improved by constructing and rehabilitating more feeder roads, extending tarmac and stone paved roads, constructing and rehabilitating bridges, constructing the district roadside station and car parks and finally establish the district motorcycle modern park stations.

4.2.4.3 Access to Healthcare

Ruhango District has various types of health care services. These services are defined to help citizens to access health services in clear and good conditions, the formal ones are set up from the

sector to District level. On sector level all nine sectors have health centers (HC) constructed by the government and development partners. All district residents are mobilised to subscribe to health insurance services (mutuelle de santé) available in each health center. 96% of the population has health insurance.

4.2.4.4 Energy Sources

The energy sector has made significant progress over the past decade, although universal access has not yet been reached. According to the Fifth Population and Housing Census (RPHC5, 2022), Ruhango District had 94,508 private households. Of these, 50.4% were connected to the national grid (77.6% in urban areas and 47.0% in rural areas), and 58.6% used electricity as their main source of lighting. Most other households relied on flashlights or phone torches (34.0%), with small shares using batteries, candles, firewood, kerosene lamps and other sources. More recent Rwanda Energy Group (REG) data show that the district's electricity access rate, including off-grid solar, was 76.5% as of April 2024, of which 52.4% of households were on the grid. This is a large improvement on the 4.3% reported in EICV3 (2010/11). Biomass remains the dominant cooking fuel in Rwanda: the 2022 Census found that 76% of households use firewood as their main cooking fuel, rising to 93% in rural areas.

The energy sector is a key driver of rapid economic transformation. Under the Second National Strategy for Transformation (NST2, 2024–2029), the Government aims to raise national electricity access from 78.9% towards universal access, with connections rolled out in all cells of the country. It also aims to scale up clean and efficient biomass cooking technologies in households and large institutions such as schools and health facilities.

4.2.4.5 Education and Literacy

In the education sector, over the last 5 years, the adult literacy rate was increased from 35.9% to 72.9% (increase of 37%). 13 schools of twelve Years Basic Education (12YBE) and 16 schools of Twelve Years Basic Education were constructed and equipped with scholastic materials. ICT facilities were constructed, 2488 Laptops were provided to 9 schools and the rate of computer literacy in schools increased up to 4.4%.

Gross enrollment rate in Primary school is 142% while that of secondary is 22%. This percentage beyond 100% in primary school is due to the effort in Universal primary education program. Teacher/ pupil ratio for primary is 1:55 whereas for secondary it is 1:45. The teacher qualification rate is 98% for primary schools, 65% for secondary schools, and 45% in TVETs. The performance Rate of primary and secondary increased up to 83% and 79% respectively.

Five (5) ECDCs and 43 nursery schools were constructed. The district has 77 primary schools with 3168 classrooms, 78,300 pupils and 1249 teachers. There are 40 secondary schools with 273 classrooms, 16204 students and 573 teachers. The district has so far 2 TVETS with 736 students and 132 teachers.

4.2.4.6 *Access to Clean Water*

The district priority is to increase rural water coverage and accessibility to people by constructing water pipeline serving the population within 9 sectors and rehabilitating existing water pipelines, constructing water boreholes serving the population in all the 9 sectors.

The district focuses on improving solid and liquid waste treatment and disposal by constructing wastewater/surface water drainage system, construct wastewater treatment plants, construct landfill and solid waste dumping site, have all rural households with rubbish pits by 2016, and complete the rehabilitation of existing nonoperational water system.

4.2.4.7 Poverty and Vulnerability Analysis

In last five years, the percentage of people below poverty line has been reduced from 66% to 48.4%, meaning a reduction of 17.6 percentage points. The percentage of the population in extreme poverty is 28.3% in Ruhango District.

The district uses different approaches initiated by the Government like One cow per family (Girinka) program, *Ubudehe* program, Vision 2020 Umurenge program (VUP), and other social assistance schemes meant for genocide survivors and demobilized soldiers, implemented by FARG and RDRC. This has improved the life of District's citizens and reduced poverty.

The current situation of VUP in Ruhango is such that 6 sectors are under VUP, where the most vulnerable benefit from the whole VUP package which include direct support, public works, financial services among others. In the last 5 years a total of 2430 HHs benefited from the VUP package with almost 365 graduating from poverty.

Other approaches were used in supporting vulnerable in the district; and has had a great poverty reduction effect: In *Girinka* program 29% of households in Ruhango got cattle; in eradication of grass thatched houses, all of them were replaced; through *Umuganda* a lot of infrastructure were constructed like roads and classrooms; through Ubudehe a lot of projects for vulnerable were financed; through FARG, number of homeless genocide survivors were settled, education support was provided student genocide survivors and income generating projects for genocide survivors were financed; demobilized soldiers were supported with health care, vocational skills, acquisition of start- up kits and provision of housing As revealed above, effort to reduce poverty has passed through many programs including Girinka program. Comparatively to the national level, the population of Ruhango District has highly benefited from this one.

4.2.4.8 Gender Analysis

Low understanding of Gender mainstreaming where even the term Gender is taken as a women issue is an important challenge for inclusive district development. For this reason, the district has resolved to promote gender-sensitive participation in all positions and equitable access to services across all sectors of the economy.

4.2.5 Socio-economic Baseline for Muhanga District

Based on the 2022 Population and Housing Census, Muhanga District has a resident population of 358,433, of whom 173,615 are male (48.4%) and 184,818 are female (51.6%). With an area of about 650 km², the average population density is roughly 550 inhabitants/km², higher than the national average of 503 inhabitants/km². The employment-to-population ratio among residents aged 16 and above is 40.4% (47.9% for men and 34.0% for women), and it is considerably higher in urban areas (57.0%) than in rural areas (35.4%).

4.2.5.1 Economic Activities

Muhanga District's economy is predominantly driven by agriculture, with over 70% of the population engaged in farming activities. Key crops include maize, cassava, vegetables, rice, and beans, cultivated both on terraced hillsides and in marshlands. Livestock farming, particularly cattle, goats, and poultry, also plays a significant role in the local economy. The district's fertile soils and favorable climate support these agricultural endeavors, contributing to food security and income generation for many households.

In recent years, Muhanga has seen a shift towards industrialization, with the establishment of an industrial zone spanning 67 hectares. This zone hosts various manufacturing facilities, including a cement factory, garment production units, and factories producing hygienic materials and kitchenware. These developments aim to diversify the local economy, create employment opportunities, and reduce reliance on agriculture.

Additionally, the services sector is expanding, supported by improvements in infrastructure such as roads and communication networks. The district's strategic location along major transport routes facilitates trade and commerce, further bolstering economic activities. These combined efforts reflect Muhanga's commitment to sustainable economic development and poverty reduction.

4.2.5.2 Road Network

Muhanga District has a well-developed road network, including around 131 km of national roads and 254 km of district roads, linking it to major urban centers and neighboring regions. Key routes such as the Kigali–Muhanga–Huye road enhance connectivity, while ongoing rehabilitation and upgrading projects aim to improve transport efficiency, support economic growth, and strengthen regional integration.

4.2.5.3 Access to Healthcare

Access to healthcare in Muhanga District is facilitated through a robust network of public and private health facilities. The district is served by several health centers, including Kabgayi Health Center, Gitarama Health Center, and Gikomero Health Center, which provide essential medical services to the local population. Additionally, private clinics such as Umurage Medical Clinic offer specialized care, complementing the public healthcare system. These facilities are supported by the national health insurance scheme, *Mutuelles de Santé*, which aims to ensure that all residents have access to affordable healthcare services. Efforts are also underway to enhance the sustainability of healthcare provision through initiatives like the Urban-LEDS II project, which focuses on improving water and energy efficiency in health centers, thereby ensuring continuous and reliable service delivery.

4.2.5.4 Energy Sources

Muhanga District’s energy supply combines grid electricity, mainly from the Nyabarongo I Hydroelectric Power Station, with off-grid solar solutions. Expansion of power lines and transformers through the Rwanda Universal Energy Access Program has connected thousands of households, while solar home systems and microcredit initiatives provide electricity to remote and low-income communities, supporting sustainable development and improved energy access.

4.2.5.5 Education and Literacy

Education in Muhanga District is strong, with a literacy rate of 78.8% and high primary school enrollment. The district has a mix of public and private schools, including specialized institutions like coding and international schools, and promotes inclusive education for children with disabilities, supporting overall human development and social equity.

4.2.5.6 Access to Clean Water

Access to clean water in Muhanga District has seen significant improvements, with around 85% of households using safe drinking sources. This progress is driven by government programs and partnerships, including the construction of water supply facilities and community-based initiatives like the Muhanga Water Fountain Project, which also promote social and economic empowerment. Despite these advances, some rural sectors such as Mushishiro, Nyabinoni, and Rongi still depend on unimproved sources, highlighting the need for continued expansion and maintenance of water infrastructure to ensure equitable access for all residents.

4.2.5.7 Gender Analysis

Muhanga District has made progress in gender equality, with women slightly outnumbering men and increasingly participating in economic activities, including non-traditional sectors like mining. The district follows national gender policies and integrates gender considerations into local planning, though challenges remain in fully implementing gender-responsive strategies and ensuring equitable access to resources and decision-making opportunities.

Chapter V: Presentation and Comparison of Considered Alternatives

The identification, consideration and analysis of alternatives is an essential component of the impact assessment process, with the primary objective being to determine the best environmental and social option. This section elaborates on the alternatives that have been identified, analyses each, eliminates non-viable alternatives and determines those that can be carried forward into the comparative impact assessment.

5.1 Identification of Alternatives

The identification of project alternatives includes the consideration of the proponent's 'preferred option', as detailed in the preliminary route design drawings. The proposed line routes and RoWs were selected among the various options, based on how well they satisfied the set criteria. Environmental soundness was given equal weight to technical and financial considerations when selecting the line routings and RoWs. In selecting the proposed route, the over-riding considerations were:

a) Route/Transmission line alignment and tower designs /or location of project activities.
b) Designs of electrical infrastructure and what technology is proposed.
c) Use of alternative technology; and
d) Various implementation methods and techniques.
e) The avoidance of environmentally sensitive areas and avoiding passing over houses, which would require demolition and hence physical displacement;
f) The minimization of the destruction of property,
g) Low pollution level by avoiding water sources and marshland's locations

The above aspects are considered, and the alternatives identified for the project are listed and described in table below:

Table 16: Description of Identified Alternatives

No	Name of Alternative	Description
1	Preferred Option: Overhead Power Lines	This alternative is as proposed by REG, detailed in the preliminary route designs received for the project, involving overhead power lines. This alternative is described in more detail in Chapter III of this report.
2	No-Go Option	This alternative means that no transmission line is constructed, and the situation remains as is.
3	Underground Power Lines	This alternative involves the construction and laying of transmission cables underground.
4	Alternative Energy Generation: Solar	This alternative involves the generation of electricity closer to the source of where it is needed, requiring connection to a mini- or localized electricity distribution grid, depending on the scale and reach of the solar facility.

No	Name of Alternative	Description
5	Construction Methods	This alternative involves the implementation of alternative construction methods, as compared to those proposed in Alternative 1 or the preferred option.

5.2 Analysis of Alternatives

The alternatives that have been identified are analyzed to determine which are viable alternatives to consider for the project. The analysis of alternatives is detailed in Table below:

Table 17: Analysis of Alternatives

No	Name of Alternative	Analysis
1	Preferred Option: Overhead Power Lines	REG has proposed the construction of overhead power lines as the preferred option. This option remains cost effective and is a well-established method of transmitting electricity in Rwanda and East Africa. The compensation will take place within 25 m of Right of Way, and only Trees with height measuring more than 5m will be felled. This option is considered viable and is assessed.
2	No-Go Option	The No-Go option goes against the national development objectives of Rwanda, as related to the increase of access to electricity for citizens. This option is however assessed further in the impact assessment, as it provides a valuable reference against which other viable options can be compared.
3	Underground Power Lines	In some urban areas, distribution and service lines are typically placed underground, for safety and aesthetic reasons and for smaller voltages. Underground cables are rarely used for higher voltages. Moreover, the proposed length of the project is approximately 21 km, which will make the use of underground lines for the entire length very costly and result in extensive earthworks/trenching along the entire route proposed; this can be 3 times more costly than overhead lines. Underground cables are also typically damaged through other future activities involving earthworks. The construction and maintenance cost of this alternative is simply too high, and it is thus considered unviable and eliminated from further consideration in this assessment.

No	Name of Alternative	Analysis
4	Alternative Energy Generation: Solar	The use of solar energy is a consideration, since the Project Area has good solar radiation. Solar energy, whether grid-tied or standalone, cannot however service high energy demands, such as for small industries like metal workshops, for instance. Other small and medium business enterprises that could make use of solar energy, would require sizeable systems, which require significant and upfront capital investment; a typical limitation in the establishment of such facilities. Typically, solar energy systems can be used for domestic applications, as well as installed in a hybrid application and tie into the national or local grid. In the case of the national grid, the necessary baseload required to ensure reliable and uninterrupted power supply, is in place through the national energy mix. Small and medium-size businesses that can afford to install grid-tie systems, would do so more readily if the surplus electricity produced could be sold back into the grid or allow for the accumulation of electricity credits. In the instance of this project, solar energy generation is not seen to be a viable option, as it will not be able to provide more cost effective and reliable electricity to trading centers in rural areas. This option is thus eliminated from the assessment. Such systems may in the future become more economically viable
5	Construction Methods and Techniques	The construction methods and techniques proposed in Alternative 1 involve largely hand work and have insignificant direct impacts. The consideration of this separate option is thus unnecessary, as it already falls into the preferred option described above. This alternative is thus eliminated

Table 18: Comparative Analysis of Alternatives (Environmental and Social Perspective)

Alternative	Technical Feasibility	Environmental Impacts	Social Impacts	Overall Assessment
Overhead Transmission Line (Preferred Option)	High – proven technology for 110 kV lines in Rwanda; cost-effective and easy to maintain	Moderate: vegetation clearing within 25 m RoW; limited impact on degraded wetlands (no towers in wetlands); low pollution risk	Moderate: land acquisition for towers, crop/tree loss, temporary disturbance, manageable community safety risks	**Preferred option** – impacts are site-specific, manageable, and mitigable through ESMP

Alternative	Technical Feasibility	Environmental Impacts	Social Impacts	Overall Assessment
Underground Cable Option	Low – technically complex for long TL (21 km) and high voltage; very high cost	High: extensive trenching leading to soil disturbance, erosion, and potential wetland disruption	High: significant disruption to land use, access restrictions, longer construction duration affecting communities	Not viable due to high cost and higher overall environmental and social disturbance
Solar Energy Alternative	Low – cannot provide required grid stability and bulk power transmission	Low–Moderate: requires land for solar farms; potential land conversion impacts	Moderate–High: large land requirement could increase displacement and land use conflicts	Not suitable for project objective (power transmission and grid stability)
No-Go Option	Not applicable	No direct environmental impacts	High negative impact: limits electricity access, slows economic development, reduces service reliability	Not acceptable due to conflict with national energy access objectives

Conclusion of Alternatives Analysis

The analysis indicates that the overhead transmission line option remains the most suitable alternative, as it provides a balance between technical feasibility, cost-effectiveness, and manageable environmental and social impacts. Although this option involves localized impacts such as vegetation clearing, land acquisition for tower footprints, and temporary community disturbances, these impacts are limited in extent, reversible (in most cases), and can be effectively mitigated through the proposed Environmental and Social Management Plan (ESMP) and Resettlement Action Plan (RAP).

Other alternatives, such as underground cabling and solar energy, were found to have either significantly higher environmental and social impacts, technical limitations, or economic constraints, making them unsuitable for achieving the project objectives. The No-Go option, while environmentally neutral, would result in substantial socio-economic drawbacks, particularly in terms of reduced electricity access and reliability, which are critical for the overall development.

Therefore, the selected option is justified as the most appropriate and sustainable solution for the project context.

Chapter VI: Potential Environmental and Social Impacts

6.1 Introduction

The objective of the assessment of impacts is to identify and assess all the significant impacts that may arise from the undertaking of an activity and findings used to inform the competent authority's decision as to whether the activity should be either authorized subject to conditions that will mitigate the impacts to within acceptable levels or refused.

In this sense, impacts are defined as the changes in an environmental parameter that result from undertaking an activity. These changes are the difference between effects on an environmental parameter where the activity is undertaken compared to that where the activity is not undertaken and occur over a specific period and within a defined area.

6.2 Impact Types

Different types of impacts may occur from the implementation of this type of project, which may be positive or negative, and can be categorized as being either direct (primary), indirect (secondary) or cumulative.

Direct impacts are impacts that caused directly by the activity and generally occur at the same time and at the place of the activity (for example, dust generation excavation activities, access restriction, land acquisition, livelihood loss etc). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

Indirect impacts are induced changes that may occur as a result of the activity (for example the use of water from a natural source at the activity will reduce the capacity for supply to other users). These types of impacts include all the potential impacts that either do not manifest immediately when the activity is undertaken, or which occur at a different place because of the activity (Jain et al, 1993; Fuggle and Rabie, 1994).

Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (for example, removal of vegetation may cause soil erosion, leading to excessive sediments in receiving stream, leading to reduced sunlight penetrating the water and thus reducing dissolved oxygen in the water and adversely affecting aquatic life and water quality).

Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts (Jain et al, 1993).

6.3 Identification of Potential Impacts

To identify the potential impacts of this project, the study used an identification matrix adapted from Leopold et al. (1971).

The matrix was designed for the assessment of impacts associated with almost any type of development project. Its main strength is a checklist that incorporates qualitative information on cause-and-effect relationships. The Leopold system is an open-cell matrix containing project

actions (sources of impacts) along the vertical axis and environmental 'characteristics' and 'conditions' along the horizontal axis.

6.4 Source of Impacts

6.4.1 Manpower

Construction works for high voltage lines will require several teams of works according to their expertise:

- After clearing the right-of-way of lines, a team of surveyors sets the location and materialize the four legs of each tower;
- A team of civil engineers follows to carry out excavations of tower bases and install, regulate and pour concrete for bases (generally four feet) of towers;
- A team for establishing the tower structure intervenes with a variable output, generally 1 to 5 towers a day;
- A team of wire and cable pullers continues the work of cable installation;
- Cleanup and rehabilitation of work sites.

Although the majority of works is done manually (tree cutting, excavation, equipment transportation, etc.), machinery on site may be used. Those are overhead shovels, trucks and power jib cranes. All works will be limited to the nominal right-of-way and access tracks and carried out during daytime.

6.4.2 Works

During the pre-construction and construction phases, sources of impact on environment and their consequences include among others:

- Construction of roads to access work sites: encroachment in wetlands, fragmentation of wildlife habitats;
- Clearing of the line’s right-of-way with width of 25 m and access roads including tree cutting and waste management: loss of vegetation;
- Management of site installations including construction of campsite: water and soil pollution from inadequate installations of wastewater and solid, liquid and hazardous materials management, etc.;
- Arrival and presence of workers in rural areas: overuse of local resources such as water, fuel wood and other natural resources such as fauna (poaching);
- Transportation and traffic related to movements of manpower, machinery and construction materials: noise, dust, security;
- Excavation works and other earthmoving and tower construction activities:
- soil erosion, encroachment in wetlands;
- Waste and contaminants (engine oil, fuel) disposal: soil and water pollution.
- The main sources of negative impacts during the operational phase are mainly:
- Maintenance (clearing) of the right-of-way: permanent control of vegetation using mechanical or chemical methods;

- Presence of line as an obstacle to movement of birds: mortality through collision;
- Presence in the landscape of line itself: landscape degradation.

It should be noted that the layout retained has already been optimized during the prefeasibility and feasibility phases in such a way as to avoid the main sensitive environmental components: protected areas, swamps, forests, etc.

6.5 Nature of Impacts

The project will generate impacts during the construction phase as well as during the operational one. It will require construction works that will extend over twenty four months. Indeed, this transmission line will be interconnecting with existing Kigoma–Mt Kigali Transmission line and the new Muhanga substation to be constructed in Muhanga industrial Park, while the other line wing will take the power from the Muhanga substation back Kigoma–Mt Kigali Transmission Line, making the line a double circuit line. Moreover, the maintenance of the RoW and the line requires periodic access to the facilities to ensure their maintenance all along the project lifespan.

6.5.1 Permanent Impacts

Those impacts are related to the operational and maintenance phases of the transmission lines. Maintenance and repair of equipment include all activities required to ensure at all times the good operation of lines. Maintenance consists especially in preventive measures for verification and repair of equipment. Teams especially trained for that task will move under conductors on the ground, at various intervals, in order to make observations on conductors, insulators, towers, etc.

Maintenance of the RoW also requires regular clearing of vegetation in order to reduce short-circuit risks caused by electric arcing.

The main permanent environmental impacts are:

- Soil erosion;
- Permanent loss of vegetation (trees and shrubs) in the RoW of lines and substations;
- Destruction of terrestrial wildlife habitats;
- Risks for birds' collision with the wires and structures;

Impacts on particularly attractive landscapes are also considered in the environmental impact assessment because they will persist all long the project lifetime.

6.5.2 Temporary Impacts

Temporary impacts are those related to the construction phase (of transmission lines and substations). They mainly consist in:

- Dust and noise emission;
- Soil erosion;
- Degradation of water quality;
- Soil contamination by a bad waste management or accidental spilling of hydrocarbons.
- Displacement of wildlife.

6.5.3 Power Line

The progress of the construction phase will be as follows:

- Siting and topographic survey of the line;
- Tree removal and clearing of the RoW over a width of 25 m ;
- Preparation of access roads and their maintenance;
- Soil testing;
- Complete construction of foundations, including grounding and measuring of towers' earth resistance;
- Erection of towers;
- Installation of cables including stringing and drawing in of cables;
- Site clean-up;
- Different tests and acceptance.

6.5.4 Access Roads

In order for the site to move from tower to tower, a road will be created along the line, only where there is no yet an access. Works will consist in creating longitudinal access roads to the various towers of the line and transverse access roads that will make it easy to join quickly the different points of the line from main roads. Longitudinal tracks will be established in the RoW of the line. Those tracks will be appropriately leveled and will include a sufficient lateral clearing of vegetation.

General features of the access roads will be:

- Width of the track: ±5 m ;
- Accessible by a four-wheel drive vehicle even during the rainy season;
- Equipped with smaller works for crossing seasonal watercourses (inverts, gabions, culverts).

The contractor will maintain in ridable state the access tracks required to reach the towers. They should be ready on the day of work completion.

Passage from one tower to another will preferably be done in straight line, in the RoW, along the line or in coming back by a curb ramp to tracks and existing works.

The layout will be established in advance, during a visit that will include the site environmental risk management officer (SESO). Some minor modifications could be made later on basis of experience acquired during works, but they will have to be approved by the SESO.

6.6 Impact Description

Impacts on the natural environment related to the different phases of the project may be described in the following table.

6.6.1 Potential Impacts During Construction Phase

Table 19: Summary of impacts on the natural environment

Activities	Physical Environment			Biological Environment				Landscape
	soil	Air	Wa	Flo	Fauna and	Protect	Species.	Lands
Preparation Phase								
Picketing of RoW			X	x	x	x	x	
Clearing of RoW			X	x	x	x	x	
Construction Phase								
Preparation of access	x	x	X	x	x	x	x	x
Construction of towers and substations	x	x	X	x		x	x	x
Transport of equipment		x			x		x	
Erection of towers and installation of cables					x	x	x	x
Site cleanup activities		x	X	x	x	x	x	
Operation Phase								
Maintenance of RoW				x	x	x	x	x
Operation & Maintenance of equipment				x				x

6.6.1.1 Soils

The impacts of construction of transmission lines and substations on the soils are particularly associated with activities for site preparation, excavation for preparation of access roads, tower erection and transport of equipment as well as installation of conductors.

Tower erection will require foundations covering about 3 m by 3 m (9m²) with a depth of 3 m, depending on the soil's conditions. Thus, affected areas are relatively reduced. Excavation works will leave those areas vegetation-free, submitting the soil of steep sectors to erosion. In addition, excavated materials will be generated and may be transported by erosion and be found in various water courses. Those materials could be reused for the development of access tracks when possible.

Soils exposed on steep slopes are particularly sensitive to erosion while hydrosoils are subject to formation of ruts. During the rainy season, impacts on soils will therefore be significantly more important than in the dry season. Thus, if the soil is wet, works could suffer delays. Those delays will have to be caught up with by using more important means (materials, personnel), which will increase the cost for works.



Figure 13: Soils in the project area

Oil and fuel used by equipments during the transmission line construction may also contaminate soil and affect biodiversity, crops and human health.

In order to avoid too many negative impacts on the soils by the works, areas with difficult topography should be spared during the establishment of access roads, as well as wetlands where soils are highly saturated. Field verification combined with map analysis confirms that the transmission line alignment has been optimized to avoid tower placement within wetlands and steep slopes. No tower is located on slopes exceeding 12%, and the steepest recorded tower location (AP2) has a slope of only 5.9%, which is within acceptable engineering and environmental limits.

6.6.1.2 Construction of Access Tracks

In order to have access to the power line, a track will have to be constructed at several places. During the drafting of this report, the location of access points are not defined because it will be the duty of the Contractor in charge of construction works.

Changes made to the topographic profile during the construction of tracks or for the substations' earthworks are permanent. However, remodeled surfaces will be reduced: ±5 m of width for the track and only the area of substations.

The nature of the soil along the RoW being not uniform and topography being very different, a change in the soil structure is to be projected. In most cases, the spoils will serve to fill in the small lows, but the provision of exogenous materials is required for the tracks to be more stable and sustainable, the latter having to serve later as access tracks for maintenance teams.

Just as mentioned previously, if works are undertaken in dry season, impacts will be reduced. In wet season, rains will cause instability and erodibility of the soil's superficial layers as well as a significant increase of water levels, the tracks will require a thicker layer of spoils. In that case, the surface of the terrain will be modified by the presence of a berm where the track will be established. In this case, works will also require much more resources (materials, personnel), which will increase the cost associated with the cost in addition to higher impacts.

The soils in the different areas concerned by this study where the transmission lines pass by belong to two major pedological groups, ferralsols and xero-ferralsols. Overall, soils are generally deep in some places, with a clay horizon and sensitive to erosion. However, in general, soft silt soils and those in areas with steep slopes represent soils that are likely to be more sensitive to erosion.

Furthermore, risks of rockslide are probable in areas with fragile soils with schizo-quartzic materials and in areas where abrupt summits, mostly ferrisols, are subject to intense erosion.

There are areas that are particularly prone to erosion in the two concerned districts.

6.6.1.3 Air and Noise

Risks of air contamination are associated with dust and gas emissions. People at risk are those living in settlements along the roads used by heavy vehicles during construction and near worksites. The issue of noise and air contamination is also linked to tree removal activities and construction of access roads to the RoW, because works will normally be undertaken during the dry season.

Combustion of fuel from vehicles used for transport of building materials is a source of air contamination, the same as for burning grass and trees from vegetation cutting to clear the line.

In some cases, works will be carried out near residences and businesses along the RoW or near the substations. Noise will result from the use of machinery and traffic during construction. Except for urbanized areas, where the normal level of noise is higher, construction will therefore cause for a certain period of time an increase in the ambient noise level.

Noise associated with construction can disturb households and neighboring communities of the RoW as well as the local wildlife. That temporary impact can be minimized by the use of various mitigation measures described in Chapter VII.

6.6.1.4 Water

The main watercourses of the study area are mainly Mwogo and Mbirurume rivers in Ruhango District and Nyabarongo river in Muhanga District. The HV lines will also cross several marshlands. The construction and maintenance of transmission lines may also have both short and long-term effects on water resources. The quality of water may be indirectly affected by soil erosion and sedimentation caused by vehicles' wading crossing, construction of temporary or permanent bridges for access roads, or during clearing of the RoW. Works undertaken will not have to cause any significant modification of watercourse flowing during the establishment of bridges, inverts, pipe arches, or culverts.

Drainage modifications due to the preparation of tower foundations, stream siltation following soil erosion and pollution caused by oil and fuel spilling, as well as encroachment in wetlands can as well cause significant impacts on water resources.

Final determination of the towers' base during construction will have to avoid watercourses, which will limit the impact on the water environment.

During the wet season, heavy rains may be responsible for soil surface erosion. Thus, accumulated materials for construction are likely to happen, if their grains are fine, to be washed away and carried to watercourses, increasing therefore the muddiness of water already high in this season. Devices for retention and sedimentation of suspended particles (deflectors, pits) will have to be installed.

The piezometric level being sometimes at the ground level, chemical components resulting from the concrete of tower foundations may be found in drinking water pumped from boreholes. Other contaminants resulting from site activities (lubricants, waste oils, solvents, etc.) may be spilled accidentally and found in the water system or ground water. In order to protect ground water, no tower should be located in a radius of less than 50 m around a borehole used for drinking water supply.

Whether in the dry season or wet season, contractors working on behalf of the project promoter must ensure that no discharge from the machinery (crankcase oil) or from the work camps (organic pollution) should be observed in the environment.

The transmission line as such will have little permanent impact on hydrography or water resources. Drainage modifications will however be long-term because the access roads and foundations of towers could cause modification to the flow pattern for surface water.

In contrast, access roads may introduce long-term damages on a large area. If the construction works are undertaken during the rainy season, their establishment will cause formation of puddles and water areas and even divert the natural flow of some watercourses, because of the importance of soil movement (cut and fill). That is why, during the realization of works, as previously indicated, the road track will be constructed with all structures required for water drainage.

Generally, whatever the equipment maintained, modified or repaired, technical teams will ensure that no leakage of contaminating or hazardous materials occurs. In case of accident, those materials will be recovered and stored in waterproof tanks for their processing.

When they are mitigated through implementation of mitigation measures, impacts associated with pollution and siltation are short-term; otherwise, they may be long-term and irreversible.

During construction, spoils will be produced during excavations of tower foundations. Those materials left in scattered piles could cause siltation of streams, which would lead to pollution. In addition, affected wetlands, especially where towers are located close to wetland boundaries, will be prone to sedimentation. Those deposits will indeed change the water's normal flow in wetlands and flooding plains leading to siltation and flooding.

6.6.1.5 Flora

Construction of a transmission line through wetlands, forests, coffee and banana plantations found along the proposed RoW requires trees and brush to be cleared from the RoW. That clearing may have an impact on the number, health and survival of species within the remaining woodlots and tree patches. The RoW is most likely to fragment forest blocks into small forest areas.

Fragmentation makes the species within the forest more vulnerable to predators and parasites, and increases competition by species coming from the edge side.

Natural vegetation and crops will be introduced during the clearing of access roads, the RoW and segments required for the campsite and work areas (manipulation of building materials). Damages to vegetation lead to destruction of habitat. The regular maintenance within the RoW of transmission lines will require clearing of vegetation in the RoW as well as along access roads. That means that no vegetation of more than 4 to 5 m of height will be tolerated within the RoW.

In a general sense, natural environments concerned by the project are degraded and ecologically poor because of expansion of human activity. The suppression of the woody component of the vegetation and the regular maintenance mowing will finally cause a localized change into savanna for the vegetation. The grassland thus created will increase risks of bushfires that are already very common in the region.

Nonetheless, the RoW of 25 m width and especially the track could create an area for access, safety, and even firebreak, on condition that no human pressure is imposed. The RoW of the transmission line will undoubtedly become a penetration track for peasants in areas so far uncleared because of access problems. Those new access tracks should indirectly lead to an increase of cleared acreage for cultivation.

Forests with eucalyptus trees and other agroforestry species exist almost everywhere in the RoW. They will be partially destroyed in order to clear the RoW and access roads.

Flora that will be affected by the construction of the transmission lines is mainly the one found in the forests and wetlands with still natural vegetation. In case of groups of trees, the clearing of the RoW is likely to break them into small wooded areas. Fragmentation of forest habitats make flora and fauna species more vulnerable to parasites and competition by species from outside.

6.6.1.6 Wildlife

Impacts on wildlife mainly include destruction of habitats, poaching and frightening by construction noise. The natural environment analysis shows relative wildlife poverty because of human presence, hunting, bushfires and degradation of biotopes.

Indeed, given the extent of sections inhabited at many places along the lines and human activities associated, wild mammals and birds have almost disappeared from the proposed corridors in some segments mainly associated with watercourses and wetlands (swamplands: birds). Birds will be affected by the noise generated by construction works such as transport, clearing, etc. It is most probable that birds and other animals from swamplands will migrate to other zones where they will then be threatened by poaching. However, that impact will only be temporary and will stop once construction works are completed.



Grey-headed sparrow



speckled mousebird

Figure 14: Bird species observed in the project sites

The impact on the fauna of open forests is small considering the low significance of the RoW in regards with the limited changes that the lines impose on the existing environment, already made of very open spaces.

6.6.1.7 Landscape

Relief features and vegetation offer beautiful and very attractive landscapes in several sections of the projects. Spectacular views on the landscape are a good potential for tourism attraction.

Construction of 110 kV transmission lines and substations can be considered as an element of incoherence in a natural landscape, because it changes the visual field of agroforestry landscapes all along the corridor. By their nature and due to spatial entities that they link, HV transmission lines hardly have a logical link with the landscape they cross. Moreover, they can hardly be hidden. Whether they are coupled or not with other infrastructure, that incompatibility remains significant.

The construction of transmission lines also requires delimitation of a corridor to establish towers and conductors. In wooded areas, where minimal distance for vertical clearance must be maintained between conductors and vegetation, it is necessary to cut and remove trees. Impacts on the visual environment also depend on the observer's perspective.

From roads, towns and villages or tourist sites, the corridor and the transmission line may have a significant negative impact on the landscape.

In order to reduce the visual impact of the line, landscape mitigation measures will have to be implemented. Among them, the following can be mentioned:

- Selection of a type of pylon adapted to the environment: less high, single-legged, etc.
- camouflage of pylons by coloration in harmony with surrounding environment; planting trees or hedges in order to block view in the RoW and camouflage particularly exposed and/or visible pylons

To mitigate the impact, the transmission corridor and the associated structures should be kept low, not higher than the hills, to minimize the visual impact of the transmission line.

6.6.1.8 Social Impacts

In addition to environmental impacts, the construction of the transmission line is likely to result in several adverse social impacts. One of the key concerns is labor influx, which may lead to competition over local resources, strain on public services, and disruption of community dynamics. This influx, combined with weak social protection systems, can heighten the risk of Gender-Based Violence (GBV) and Sexual Exploitation and Abuse (SEA), particularly targeting women, girls, and other vulnerable groups. Increased traffic from construction vehicles may pose road safety risks, especially in populated or school zones. Furthermore, the congregation of workers and increased mobility may facilitate the spread of communicable diseases, including sexually transmitted infections and respiratory illnesses. These risks call for comprehensive mitigation measures such as strict Codes of Conduct, community awareness, traffic management plans, and health and safety protocols.

In addition, the project will involve land acquisition and restrictions on land use within the Right of Way (RoW), which may result in loss of land for tower foundations and loss of crops and trees, thereby affecting the livelihoods of Project Affected Persons (PAPs). Although permanent land acquisition is limited to tower footprints, temporary and partial economic displacement may occur due to restrictions on land use and vegetation clearance. There is also a risk of community concerns related to compensation adequacy, delays in payment, and potential grievances if not properly managed. Furthermore, community health and safety risks may arise from proximity to construction activities, including exposure to open excavations, falling objects during tower erection, and potential electrocution risks during operation if safety measures are not respected. Additional social risks include occupational health and safety issues for workers, potential use of informal labor, and risks related to child labor or unfair working conditions if not adequately controlled. Vulnerable groups, including female-headed households, the elderly, and low-income households, may be disproportionately affected by these impacts. These risks necessitate the implementation of robust mitigation measures, including a Resettlement Action Plan (RAP), effective grievance redress mechanisms, targeted support to vulnerable groups, enforcement of labor management procedures, and continuous stakeholder engagement throughout the project lifecycle.

6.6.2 Potential Impacts During Operational Phase

6.6.2.1 Potential Impacts Due to Electromagnetic Fields

A high-voltage transmission line generates an electric field (related to the voltage) and a magnetic field (related to the current). Such fields are also produced naturally (the Earth's magnetic field) and by professional and household electrical equipment (television, razor, drill, etc.).

Power transmission lines generate low levels of non-ionizing radiation. For a 110 kV line, the electric field is approximately 2,500 V/m under the conductors, 250 V/m at 25 m from the axis and 25 V/m at 100 m from the axis. The magnetic field does not exceed 15 µT (microtesla) under the conductors and decreases quickly with distance from the line axis: about 2 µT at 30 m and 0.2 µT at 100 m.

By comparison, an electric razor generates a magnetic field of about 1,000 µT at 3 cm.

Numerous working groups have been established to study the impact of electric and magnetic fields on health. To date, no epidemiological study has established a clear causal relationship between health and exposure to electromagnetic fields.

6.6.2.2 Potential Impacts of Transmission Lines on the Flora

In the RoW of the line, vegetation should always be cleared and removed to avoid affecting operation of equipment and that will be done regularly by clearing. Natural vegetation along the line, especially for the relics of savannas and forest remnant at the side of swamps, will be cleared. Eucalyptus trees will also be eliminated in the RoW, which has an impact on the population's lifestyle and biodiversity in those areas. There will be not only savanna and trees, but also operation will accelerate disappearing of that natural vegetation because the surrounding population will benefit from the clearing to extend their fields.

Vegetation clearing could disturb wildlife that is in the remnant patches of gallery forest and swamps, by putting more pressure on animals that live in that environment. The population along that line could take advantage of that vegetation clearing to hunt fauna that lives in that area.

6.6.2.3 Impacts on Fauna – Birds and Bats

The construction and operation of transmission lines can pose significant risks to avifauna and bats, particularly through collisions and electrocutions. These impacts are especially critical near wetlands, rivers, and other water bodies, which often host large populations of waterbirds and serve as important foraging and nesting habitats for raptors. In addition, bats are vulnerable due to their flight patterns and echolocation behavior, which can be disrupted by overhead infrastructure. If the transmission line crosses internationally recognized bird or bat migration routes or regionally important flyways, the magnitude of these impacts increases substantially. However, the transmission line does not cross any internationally recognized bird or bat migration routes, and no bat was spotted along the line route. In the Southern Province of Rwanda, the Akanyaru Wetlands, on the border with Burundi, are recognized as a Key Biodiversity Area and Important Bird Area (BirdLife International, 2024; Key Biodiversity Areas Partnership, 2012). The site covers about 225 km² and supports at least 54 wetland bird species, including migrants such as the Madagascar Pond-heron (*Ardeola idae*), Pallid Harrier (*Circus macrourus*) and Great Snipe (*Gallinago media*). Nyungwe National Park in the south-west is also designated as an Important Bird Area (BirdLife International, 2024). The field assessment found no bird migratory route within the transmission line right-of-way (RoW) and its 500 m buffer zone, which is consistent with these key sites lying outside the project area.

6.6.2.4 Potential Positive Social Impacts

Availability of reliable electricity supply in the National grid due to the network strengthening and this will finally contribute to the improvement of socio-economic status of the population in general. Among indirect impacts that would result from the reliable and stable grid would be that different residential areas, commercial centers, handcraft businesses, Schools, Public utilities, Water Supply infrastructures like water treatment plants and water pumping systems, public offices among many others could profit from a permanent and stable electricity supply.

As a consequence, the quality of life and extent of economic opportunity will be transformed. Social and environmental costs, not least in noise and air pollution, associated with existing generator usage will be reduced, with more limited requirement for firewood cutting and collection.

While major attention will focus on loss of income due to temporary disturbance to fields or grazing areas, and on health conditions related to the influx of foreign workers, positive opportunities to PAPs may be presented in the form of temporary employment during the construction phase, as well as through income generated by the sale of food and other consumables to migrant workers.

It is expected that the proposed project will create numerous direct jobs, many of which will be sourced from the project area. A significant proportion of these jobs will go to people in the lower income brackets. Direct income effect will come from salaries and wages paid to workers and income from locally sourced contracts for services such as security, bush clearing, catering and transport. The project will thus give a boost to the local economy, indirectly benefiting small-scale farmers and local small enterprises.

6.6.3 Negative Impacts

The main potential adverse impacts of the Project would occur mainly during the construction stage in the form of:

Table 20: Quantification of negative impacts caused by the proposed TLs

Criteria	Numbers
i. Total land area needed for land acquisition in the tower location	1.8 ha
ii. Total land area for crops such as plantations affected by the transmission line RoW/corridor	47.23 ha
iii. Total forest area affected by the transmission line RoW/corridor	4.05 ha
iv. Total residential area affected by the transmission line/corridor	1.22 ha
v. Total No. households and persons affected by the RoW	797 HHs with 3,347 PAPs
vi. Total No. households and persons affected by the transmission line (TL traversing the residential dwellings) and the installation of towers (separately for the line and the towers)	15 HHs will be physically displaced representing 64 PAPs distributed in both districts; 2 HHs with 9 Muhanga and 13 HHs in Ruhango District with 55 PAPs

Criteria	Numbers
vii. Total No. commercial structures affected by the transmission line (TL traversing the commercial structures) and the installation of towers and their No. of owners (separately for the line and the towers)	0
viii. Total No. ancillary structures affected by the transmission line and the towers and their No. owners (separately for the line and the towers)	0
ix. Total No. common properties affected by the transmission line (TL traversing the common properties) and the towers (separately for the line and the towers)	5
x. Affected No. vulnerable households and persons	32 vulnerable HHs (see Section 4.2.2)
xi. No. timber and fruit-bearing trees to be affected disaggregated by their species types and sizes (large/medium/small)	Large: 1,543 Medium: 2,324 Small: 8,746

Furthermore, the anticipated impacts will be:

- Temporary and limited air and noise pollution due to construction activities;
- Loss of biodiversity as a result of loss of flora and loss of habitat for fauna;
- Increased risk of communicable diseases during the construction phase.
- Additionally, potential public safety hazards are enhanced for a project such as the proposed transmission line project when the local population has not been properly educated and sensitized with regard to the potential hazards. Permanent loss of land will happen for towers location due to land acquisition needed for their establishments.

6.6.3.1 CO2 Emission Equivalent of Trees to Be Felled

A detailed tree inventory was conducted using systematic corridor transects along the 25 m Right of Way (RoW), identifying a total of 12,613 trees, including 1,543 large trees, 2,324 medium trees, and 8,746 small trees, dominated by *Eucalyptus spp.*, *Grevillea robusta*, and fruit trees (*Persea americana*, *Mangifera indica*, *Psidium guajava*).

To estimate carbon loss, the assessment applied IPCC Tier 1 default biomass values for tropical agroforestry systems (IPCC 2006 Guidelines), with conservative assumptions as follows:

- Small trees: **0.05 t dry biomass/tree**
- Medium trees: **0.30 t dry biomass/tree**
- Large trees: **1.50 t dry biomass/tree**

- Carbon fraction: **0.47**
- Conversion factor: **$CO_2 = C \times 44/12$**

Table 21: Estimated Carbon Stock Loss

Tree Category	Number	Biomass (t/tree)	Total Biomass (t)	Carbon (tC)	CO_2-eq (tCO_2)
Small	8,746	0.05	437.3	205.5	753.6
Medium	2,324	0.30	697.2	327.7	1,201.5
Large	1,543	1.50	2,314.5	1,087.8	3,988.7
Total	12,613	—	**3,449.0**	**1,621.0**	**5,943.8**

The total estimated loss is therefore approximately 5,944 tons of CO_2-equivalent.

Given that the affected vegetation is largely planted agroforestry and non-natural tree cover, the carbon impact is considered moderate and recoverable. To offset this loss, the project will implement compensatory reforestation and agroforestry programs, with a minimum replacement ratio of 1:3, prioritizing fast-growing species (*Eucalyptus*, *Grevillea*) and native species where feasible. This is expected to fully offset the carbon loss within 5–10 years, while also enhancing local ecosystem services and community benefits.

6.7 Climate Hazards and Implications for Transmission Line Infrastructure

The proposed 110 kV double-circuit transmission line traverses the Southern Province of Rwanda, where climate conditions are characterized by seasonal rainfall, moderate temperatures, and increasing variability linked to climate change. Based on national meteorological data, field observations, and regional climate projections, the key climate-related hazards relevant to the project include intense rainfall and flooding, lightning strikes, and strong winds/storm events.

6.7.1 Flooding and Intense Rainfall

Seasonal heavy rains (March–May and September–December) can result in localized flooding, increased surface runoff, and soil saturation, particularly in low-lying areas and wetlands such as those identified along the project route (e.g., Rugeramigozi and wetlands in Ruhango District). These conditions may:

- Undermine tower foundations through soil erosion and reduced bearing capacity
- Damage access roads and restrict maintenance activities
- Increase sediment transport into nearby watercourses

However, the project design minimizes such risks by avoiding tower placement within wetlands, maintaining natural drainage patterns, and limiting disturbance to riparian zones. Towers are located on stable ground, and the maximum slope recorded for tower placement (5.9%) remains within safe engineering limits.

6.7.2 Lightning

Rwanda experiences relatively high lightning frequency, especially during rainy seasons. Transmission lines are inherently exposed to lightning strikes, which may:

- Cause temporary outages and equipment damage
- Affect system reliability

To address this, the design incorporates overhead shield (earth) wires and proper grounding systems, which are standard for high-voltage transmission infrastructure and significantly reduce lightning-related risks.

6.7.3 Windstorms

Although extreme wind events are not frequent, localized storms may generate strong gusts capable of:

- Causing **mechanical stress on towers and conductors**
- Leading to conductor swing, potentially increasing vegetation contact risks
- Affecting structural stability in exposed areas

These risks are mitigated through:

- Engineering design compliant with **wind load standards for transmission towers**
- Adequate conductor clearance within the **25 m Right of Way (RoW)**
- Avoidance of highly exposed ridgelines where feasible

6.7.4 Implications for Project Design and Operation

The combined effect of these climate hazards has been considered in the project planning and design. The transmission line alignment avoids high-risk areas such as steep unstable slopes and wetlands, while engineering measures (foundation design, grounding, and structural specifications) ensure resilience to anticipated climatic stresses.

Overall, the risk of climate-related structural failure is assessed as low to moderate, provided that routine maintenance, vegetation management, and monitoring are effectively implemented.

6.8 Bird Movement and Flight Corridor Assessment (Avifauna)

A targeted assessment of bird movement patterns was undertaken through field observations along the transmission line corridor, with particular attention to wetlands, valley depressions, and cultivated lowlands. Observations were conducted during peak activity periods (early morning and late afternoon), when bird movement between feeding and roosting areas is most pronounced.

The assessment indicates that the project area does not constitute a major migratory flyway. Bird movements are primarily localized between fragmented wetlands and adjacent agricultural fields. These movements are typically low-altitude and dispersed, involving common and adaptable species such as the Pied Crow, Cattle Egret, Sacred Ibis, and Grey-headed Sparrow.

Wetlands such as Rugeramigozi and those in Ruhango District function as minor feeding grounds rather than critical flight corridors. No concentrated flight paths or high-density movement

corridors were identified during field surveys. In addition, the absence of large water bodies and intact natural habitats limits the likelihood of significant bird congregation or migratory activity.

Therefore, the risk of bird collision or disruption of critical flight corridors is assessed as low. Nonetheless, precautionary measures such as installation of bird diverters in wetland crossing sections are recommended to further reduce potential risks.

Table 22: Bird Collision Risk Ranking at Wetland Crossings

Wetland Name	Location	Ecological Characteristics	Bird Activity Level	Collision Risk Level	Justification	Recommended Mitigation
Rugeramigozi	Muhanga District (Nyamabuye Sector, Gahogo Cell)	Largest wetland; highly degraded; intensive agriculture (maize); near road (NR1) and industrial park	Moderate	**Medium**	Larger size and proximity to water and open space attract more birds (e.g., egrets, ibis); some localized movement expected	Install bird diverters on conductors across wetland span
Gasenyi–Rwamikara	Ruhango District	Small, cultivated wetland; fragmented habitat	Low	**Low**	Limited ecological value; low bird concentration; mostly farmland species	No specific measure beyond general monitoring
Kamugongo–Bakoni–Kamonyi–Gahengeri	Ruhango District (Byimana Sector)	Fragmented and cultivated; no open water bodies	Low	**Low**	Highly modified landscape; minimal bird congregation	General monitoring only
Nyabikone	Ruhango District (Byimana Sector)	Seasonal wetness; agriculture dominant	Low to Moderate	**Low**	Some temporary bird presence during rainy season but not concentrated	Monitoring during operation phase

Wetland Name	Location	Ecological Characteristics	Bird Activity Level	Collision Risk Level	Justification	Recommended Mitigation
Nyamugafi	Ruhango District (Byimana Sector)	Similar to Nyabikone; cultivated wetland	Low	**Low**	No significant feeding or roosting areas identified	No specific mitigation required
Urugondo	Ruhango & Mbuye Sectors	Wettest among Ruhango wetlands; presence of grasses (*Pennisetum clandestinum*); still cultivated	Moderate (localized)	**Medium–Low**	Slightly higher moisture content may attract birds, but still highly disturbed and fragmented	Consider bird diverters if monitoring shows increased activity

6.8.1 Summary of Findings

- No major migratory bird corridors were identified
- Bird movements are localized and low altitude, mainly between:
  - Wetlands
  - Agricultural feeding areas
- All recorded species are common and classified as Least Concern (IUCN)
- Overall collision risk is Low across most of the corridor, with:
  - Medium risk only at Rugeramigozi wetland
  - Medium–Low at Urugondo (precautionary classification)

6.8.2 Mitigation Strategy Based on Risk

- Medium Risk Areas (Rugeramigozi):
  - Install bird diverters/flight markers on shield wires and/or conductors
  - Prioritize spans crossing open wetland sections
- Medium–Low Risk Areas (Urugondo):
  - Monitoring during operation
  - Install diverters if increased bird activity is observed
- Low Risk Areas (All other wetlands):
  - No specific structural mitigation required
  - Include in routine environmental monitoring

6.9 Summary of Potential Impacts

Table 23: The summary of the project's impacts on the natural environments

Phase of Works	Environmental Component	Type of impact	Duration of impact	Extent of impact	Intensity of impact	Importance of impact
Construction						
Loss of land	Social	Opportunity cost for the landowner to use the land concerned by RoW	Permanent	Local	Average	Average
Loss of commercial trees	Social	Opportunity cost to grow and get income from selling the Trees	Permanent	Local	Average	Minor
Public safety related to electricity mishandling	Social	Risk of electrocution due to little experience with electricity	Temporary	Local	Minor	Minor
Marking and clearing of the RoW	Flora	Destruction of vegetation coverage	Permanent	Common	Average	Major
	Fauna	Loss of habitats	Permanent	Common	Low	Average
Earthworks including preparation	Soils	Erosion Formation of road ruts	Temporary	Common	Low	Average

Phase of Works	Environmental Component	Type of impact	Duration of impact	Extent of impact	Intensity of impact	Importance of impact
of access tracks and foundations of towers	Water	Contamination by accidental discharges of contaminants Modification for surface drainage or sedimentation and turbidity in waterways as a result of erosion.	Temporary	Specific	Low	Minor
	Air	Liberation of dusts and gas	Temporary	Specific	Low	Minor
	Flora	Destruction of species	Permanent	Specific	Low	Minor
Site installations including campsites and work areas	Soils	Contamination by domestic materials	Temporary	Specific	Low	Minor
	Water	Contamination through solid, liquid or hazardous materials and wastewater	Temporary	Specific	Low	Minor
Presence of workers	Water	Overexploitation of resource	Temporary	Specific	Low	Minor
	Flora	Harvest trees as fuel	Temporary	Specific	Low	Minor
	Fauna	Disturbance of fauna and Poaching	Temporary	Specific	Average	Average
Transport and circulation	Air	Noise and dust	Temporary	Specific	Low	Minor

Phase of Works	Environmental Component	Type of impact	Duration of impact	Extent of impact	Intensity of impact	Importance of impact
Operation						
Maintenance of RoW	Flora	Destruction of vegetation cover disturbance of fauna, generation of waste	Permanent	Common	Average	Major
Presence of power line	Fauna	Bird collisions and electrocutions	Permanent	Specific	Average	Average
	Landscape	Visual degradation of landscapes	Permanent	Specific	High	Major

Chapter VII: Mitigation & Enhancement Measures

7.1 Impact Mitigation Measures

All the proposed mitigation measures should be implemented during construction and integrated in the contractor's Agreement if appropriate.

7.1.1 Mitigation Measures During the Pre-construction Phase

7.1.1.1 Mitigation Measures for Land Acquisition and Livelihood Impacts (Pre-Construction Phase)

Prior to the commencement of construction activities, all land acquisition processes shall be completed in full compliance with the national legal framework and the applicable international standards, ensuring that compensation is paid at full replacement cost and prior to any displacement or restriction of land use. A detailed Resettlement Action Plan (RAP) shall be implemented, including verification of affected assets, transparent valuation, and timely compensation for land, crops, trees, and structures. Special attention shall be given to vulnerable households to ensure they receive additional support where needed. Livelihood restoration measures, such as agricultural support, access to alternative land use, or income-generating activities, shall be provided to affected persons whose economic activities are disrupted. A functional Grievance Redress Mechanism (GRM) shall be established and operational before land acquisition to address complaints promptly and fairly. Continuous stakeholder engagement and disclosure of information shall be ensured throughout the process to maintain transparency, minimize conflicts, and safeguard the rights and livelihoods of Project Affected Persons (PAPs).

7.1.1.2 Establishment of Project and Landscape Mitigation Measures

The efficient reduction of the visual impact of pylons or line is generally difficult. Therefore, it is preferable to talk about landscape mitigation measures. Visual absorption is indeed only provided for when the visibility area is reduced, the "complex" landscape (including many components), and less "readable" (disorganized). In practical terms, absorption may be achieved by putting the line along the edge, turn around a line of ridge, etc.

The success of landscape mitigation measures results from the use of landscape components (vegetation, relief, and housing) and consideration of visibility zone. Inclusion of a power line into landscape is therefore facilitated by the presence of large size components near it. The observer then tends to underestimate the real size of towers in regards with what surrounds them. In contrast, when other components of the landscape are of small size, then pylons will appear big.

Also, the peri-urban environment with small size will not be able to dissimulate the structures.

It is possible to mitigate the effect of vertical structures by proposing lower towers and therefore less spaced, but also by establishing structures in such a way as to seek visual support on slopes in order to follow best the shapes of the landform.

In case avoidance of the visual perimeter is not possible, it is advisable to seek mountain slopes, and they should be kept away if possible from the areas of ridge crossing.

The impact introduced by the establishment of a HV link may be mitigated by using at best existing configurations and by choosing the best-adapted technical infrastructure.

In semi-urban environments, solutions to mitigate the visual impact may be an alignment of pylons because a less rectilinear layout will cause an impression of "visual disorder"

7.1.1.3 Soil Conservation

During the planning and especially access to work sites, impacts regarding risks of increased erosion or deterioration of soils may be mitigated through:

- The use of existing tracks, if possible.
- The creation of new tracks restricted to its minimum needed and in consultation with interested landowners and authorities.

7.1.1.4 Special Provisions to Be Included in Contractors' Contract

Apart from the measures considered during the design, preventive measures will be also implemented during realization of works.

Thus, in the context of works that the Promoter undertakes or has undertaken by others, he will define general and technical clauses for supply, setting and test of network, supply and erection of electric equipment, as well as implementation of all works related to the project.

Those clauses constitute the best practices in terms of construction of electric network and ensure the project is well integrated into the environment. The successful bidder for the project must comply fully with the laws and regulations in force in Rwanda, regarding environment protection and rehabilitation of environments affected by the project. Additionally, the contract will have to require from the Contractor to prepare and implement:

- A drainage and erosion control plan;
- A rehabilitation plan for disturbed areas;
- A waste management plan;
- An emergency plan in case of spilling of contaminants;
- A fuel and other hazardous materials management plan.

In addition to those clauses, specific mitigation measures recommended in the context of the environmental and social study should also be included into the project and their implementation will have to be enforced during works through environment and social risk management and monitoring program.

7.2 Mitigation Measures During the Construction Phase

7.2.1 Site Organization

Among the measures that will have to be implemented and respected in the site general organization during construction works, there are:

– To mark out physically (pegging, ribbon, etc.) the limits of the RoW within which works will have to be undertaken;

- On cultivated land, to make only one provisional access track in consultation with the owners and occupants before opening the site;
- On the site and access roads' area, to restrict work timetable between 07h00 and 18h00 in order to limit disturbance of local populations with noise;
- The Contractor must regularly maintain equipment (air hammer, compressors, pile drivers, crushing machines, etc.) and any other noisy material that constitute sources of significant nuisance. He also must ensure that silencers of his machinery are always in good condition.
- To undertake preventive maintenance of machinery and vehicles in order to prevent fuel and lubricant leakages.
- To take necessary measures to avoid any spillage of oil products during supply of vehicles and machinery, and to provide for an emergency plan in case of accidental spillage of contaminants;
- To have at disposal a response kit in case of accidental spillage of contaminants near the place where works are being undertaken.

Construction camps will be equipped with septic tanks and disposal fields to receive wastewater or latrines (at minimum one for 20 people).

In accordance with the Plan for storage of fuel and other hazardous materials, the Contractor must recover and store in liquid tight containers, correctly identified, all hazardous materials and contaminant products generated in the normal course of site operations (used oils, solvents, plasters, etc.), then send them to potential take-overs or another site with appropriate authorization to handle them.

At the end of works, the Contractor will ensure that the site is restored to its initial condition and will clean up all materials, wastes and littering. All the surfaces affected will have to be restored to their natural condition or to the nearest possible condition to the initial condition; similarly, site areas will have to be rehabilitated after the completion of works.

During the whole duration of works, the Officer in charge of environmental and social risks will ensure compliance with all environmental standards and implementation of environmental recommendations. Implementation of those general measures of site organization will therefore help to mitigate the project's incidences on environment and integrate it harmoniously into the environment.

7.2.2 Solid Waste Management

Solid waste management is a major issue in such kind of project. Indeed, the project will extend to several sites distributed over a distance of several kilometers. Production of solid wastes (non-dangerous) should be likened to the one of a small town. Littering collection is then at risk of meeting serious logistic issues. Waste management systems in sections crossed are indeed often lacking. Before starting the work, the Contractor shall submit a waste management plan for approval. The project promoter should encourage the three Rs: Reduce, Reuse and Recycle. The use of hazardous materials must be reduced or eliminated, and the use of public landfills must be restricted as much as possible.

Construction debris (woods, steel, cartons etc.) produced on work sites should be picked up with work progress on site. Then those debris will be recovered and recycled or otherwise eliminated, either by disposal in controlled landfills, or by burial in an appropriate site, approved by the Site Environmental and Social Officer (SESO) and by local authorities.

In all cases, the Contractor will be responsible for the sound waste management on construction site and in workers' campsite. In addition, before starting of works, the Contractor will have to submit a Waste Management Plan to the SESO for approval.

7.2.3 Oil Products Management

Fuel needs for the site machinery and generation of power (generators) required for site works will have to be specified. It seems probable that the Contractor must prepare a fuel storage park and install oil product tanks to meet the needs.

Before starting works, the Contractor will have to present a Management Plan for fuel and other hazardous materials. That plan includes, among other things, an estimate of fuel needs, location and mode of storage, as well as environment protection measures that will be taken, including a contingency plan in case of accidental spillage. The Plan will also have to provide for areas dedicated for maintenance of site vehicles (oil change, repair, etc.).

In case of contamination, costs for soil and water rehabilitation shall be borne by the Contractor.

7.2.4 Protection of Natural Environment and Vegetation

Measures shall be implemented during the marking and initial clearing of the RoW:

a. Before clearing the RoW and work areas, the Contractor will have to ensure first of all that the limits of clearing were marked on the ground before the start of work, with markers, and he must obtain authorization from the site environmental social risk management officer;
b. The SESO will ensure to respect the limits of deforestation that will have been indicated at the construction site;
c. Only the clearing needed for construction works is authorized. Clearing must be limited to the minimum required;
d. To conserve all the vegetation (trees, shrubs, herbaceous, crops) present at the edge of watercourses and on steep slopes;
e. In order to respect the flow of water and biodiversity, to maintain watercourses, streams, swamps and trenches free of any vegetation debris or any other wastes;
f. Wood harvested must be cut into sections, put and left on site for the benefit of landowners or the community;
g. To compensate the loss of tree vegetation by planting of equivalent areas.

7.2.5 Wildlife Protection

In order to protect wildlife resources often already at risk:

h. To forbid collection of fauna or flora species;

i. To prohibit possession of firearms on site and to prohibit hunting and fishing activities at all times for construction site workers;
j. To strictly control poaching and take the offenders to the authorities.
k. To avoid the construction of towers in the wetlands, water courses or their buffer
l. To avoid the construction in the sensitive or protected area.

7.2.6 Water Protection

Several measures need to be implemented in order to limit accidental risks of polluting surface water and ground water:

m. No watercourse may be forded. To erect preferably a bridge or a culvert to allow vehicles and construction equipment to cross a watercourse. The construction of such facilities must respect best practices and should not reduce the width of the watercourse by more than 20%. Their size must allow free flood flow. They should not either impede migration of fish. During the development of such facilities, to avoid sensitive periods such as high waters or spawn of fish.
n. To protect ground water during construction, ensure that no tower is erected in a distance less than 50 m around a well or borehole serving for drinking water supply.
o. To forbid any temporary or permanent disposal of excavated materials in a watercourse or in an environment likely to be flooded, except for towers and tower struts;
p. To prohibit supply of vehicles and machinery and maintenance of equipment (oil change, repair) at less than 30 meters from watercourses and flood-prone areas;
q. To prohibit any storage of fuel at less than 60 meters from a watercourse. The Contractor will have to seek approval from the SESO for locations that may serve for handling and storage of hazardous materials;
r. Before beginning of works, to require from the Contractor to submit an emergency plan in case of leakage or accidental spillage of contaminant;
s. In case of pollution, to trigger the procedure of intervention in case of emergency provided for in the above-mentioned plan.
t. Avoid to erect the towers in the water courses or its buffer.

During the wet season, heavy rains may be responsible for surface soil erosion. Thus, materials accumulated for constructions of the track or substations are likely, if their grains are very fine, to be carried away and transported towards watercourses by increasing therefore the already high turbidity of water during this season.

Before start of works, the Contractor must submit an erosion control plan to the SESO for approval; He must install devices for retention and sedimentation of suspension particles (deflectors, pits).

7.2.7 Earthwork

A series of measures must be introduced to limit general impacts of earthmoving.

u. To require from the Contractor to present a drainage and erosion control plan;
v. To reuse materials resulting from spoils such as ballast materials, if their geotechnical features allow. Otherwise, to dispose all excess materials (soil, stones, blocks, etc.) in such a way as to reduce their visual impact and allow their optimal integration into the

surrounding landscape. To backfill areas of disposal of materials so that once they are completed, their final geometry fits in the natural shape of land and facilitates their integration to the landscape.

w. Not to authorize any solid waste (wood, steel, etc.) nor contaminated materials in the ballasts.
x. If need be and if possible, to stabilize, to drain and to pitch or replant spoils and ballasts.
y. To minimize the loss of arable soil during earthmoving, to strip and separately store the layer of top soil, then to proceed to excavation in depth of the remainder soils;
z. The Contractor will have to prepare and implement a plan for rehabilitation of disturbed areas including areas of storage of ballast materials;
aa. Immediately after intervening in one section, and without waiting for the end of work site, to stabilize soils against erosion by using indigenous species with rapid growth;
bb. At the end of works, to reuse the top soil for rehabilitation of disturbed sites;
cc. Not to wait until the end of construction work to proceed to rehabilitation works of disturbed areas, but to proceed with progress of works;
dd. To check performance of stabilization measures after rains and to take necessary corrective measures to ensure efficiency of measures in the future;
ee. During earthmoving works near residences, to use water as dust suppressor in order to reduce at minimum the dust coming from movement of trucks and other construction equipment.

7.3 Mitigation Measures During the Operation Phase

During the operation phase, mitigation measures of impacts will have to be implemented, namely:

- To use mechanical methods for vegetation control in the RoWs instead of phytocides;
- To promote the use of RoW for farmers in order to reduce the use of vegetation control methods;
- To introduce a monitoring program for impacts of the line:
  - Avian fauna;
  - Water quality;
  - Erosion;
  - Landscape.

7.4 Mitigation Measures for Social Impacts

Regarding Social Impacts, mitigation measures should include:

7.4.1 Pre-construction Phase

Land acquisition will be carried out in accordance with the prevalent domestic laws and World Bank on land acquisition, restrictions on land use and involuntary resettlement, which require identification and quantification of any impacts on land-based livelihood, and adequate compensation to landowners and people relying on the land for their livelihood. The compensation would be paid, before the start of works as per the resettlement plans.

A detailed analysis of resettlement impact and mitigation strategies is done in the context of the Resettlement Action Plan.

7.4.2 Construction Phase

The basic environmental management principles to follow during construction of the HV transmission lines are outlined below. Adherence to these guidelines will further reduce the potential adverse impacts which may arise during construction:

- Consult villagers regarding location of valued village resources and locate transmission lines to avoid these features.
- Minimize the need to construct new access tracks wherever possible.
- Use existing access roads and tracks wherever available.
- Ensure minimum clearance distances between conductors and ground, waterways, road crossings, buildings, communication systems etc.
- Clear only a narrow path to facilitate pulling the nylon rope between towers to string conductors.
- Strictly define RoW clearing activities in the contract specifications.
- String conductors under tension to minimize potential damage to remaining ground vegetation.
- Decommission and rehabilitate excess temporary access tracks as soon as they are no longer required.
- Construction to proceed in the dry season if possible to minimize soil erosion and mass wasting and to limit loss of crops (which are not grown in the dry season); where construction is required in the rainy season, potentially unstable slopes to be avoided.

Gender-Based Violence (GBV) / Sexual Exploitation and Abuse (SEA):

- Enforce a strict Code of Conduct (CoC) for all workers and contractors.
- Provide training and awareness sessions on GBV/SEA prevention for workers and communities.
- Establish a safe, confidential Grievance Redress Mechanism (GRM) that is accessible to women and vulnerable groups.
- Partner with local NGOs or service providers to support survivors of GBV/SEA.

Labor Influx:

- Prioritize local hiring where possible to reduce the need for external workers.
- Develop a labor influx management plan in coordination with local authorities.
- Monitor worker behavior and community relations through regular social monitoring.
- Establish clear camp management rules, including curfews, restricted movement, and no-contact policies with minors.

Traffic Impacts:

- Prepare and implement a Traffic Management Plan (TMP) in collaboration with traffic police.
- Schedule movement of heavy vehicles during off-peak hours.

- Install warning signs, speed control measures, and ensure safe pedestrian crossings near schools and populated areas.
- Conduct road safety awareness campaigns in affected communities.

Disease Transmission (including STIs, COVID-19, etc.):

- Provide health screening for workers before mobilization and periodically during construction.
- Ensure access to basic health services and first aid at worker camps.
- Organize community health awareness campaigns, including STI/HIV and hygiene education.
- Promote good sanitation and hygiene practices in worker camps and workplaces.

All site clearance works shall be carried out within defined perimeters and only when necessary. The maximum permissible time lapse between site clearing and initiation of construction operations shall be reduced to a minimum. Vegetation along the RoW shall be kept to the barest minimum to permit safe operation. Trees felled from site shall be re-utilized for the benefit of the host communities or as otherwise requested in consultation with the communities. Areas cleared in excess of operational requirements during construction shall be restored with indigenous species and maintained for at least three years

7.5 Environmental and Social Management Plan (ESMP)

The Environmental and Social Management Plan (ESMP) provides the conditions under which the project must be implemented, upon approval from the Rwanda Development Board (RDB). The provisions of the ESMP must be implemented in final design stages, as well as the construction and operational period of the project. It is critical that the provisions of the ESMP be fully implemented to enhance positive impacts and avoid significant negative environmental and social impacts.

It is important to note that this ESMP is focused on the design, construction and operational phases of the proposed project. Preliminary design specifications from an environmental and social point of view were taken into consideration in the assessment and compilation of the ESIA, providing input with regards to possible mitigation measures to reduce environmental and social impacts.

7.5.1 Roles and Responsibilities: REG's Role

REG (Rwanda Energy Group), as the proponent of the project, is responsible for the effective implementation of the project, in compliance with all approvals. REG must ensure compliance with the conditions inherent to the ESMP approval by RDB[3]. REG is the project proponent and shall therefore be the entity responsible for monitoring the implementation of the ESMP and compliance with the RDB Certificate of Approval. However, REG will appoint a construction Contractor, who will be responsible for implementing the proposed construction of the 110 kV double circuit transmission line and hence implement the proposed mitigation measures documented in this

ESMP. REG should also appoint an Environmental Supervising Consultant to monitor and report on compliance with ESMP, as has been elaborated upon below.

7.5.2 REG's Environmental and Social Specialists

For the purposes of implementing the conditions contained herein, the REG's Environmental Specialist shall be the responsible person for ensuring that the provisions of this ESMP, as well as the Certificate of Approval once/if issued by RDB, are complied with during the planning, construction and operation of the transmission line project. The REG Environmental Specialist and/ or appointed E&S Supervising Consultant/s will be responsible for issuing instructions to the Contractor where environmental and social considerations call for action. The REG Environmental and social Specialist and/or appointed E&S Supervising Consultant/s shall submit regular written reports to REG, but not less frequently than on a monthly basis.

The REG Environmental Specialist and/or appointed E&S Supervising Consultant/s will be responsible for the monitoring, reviewing and verifying of compliance with the ESMP and conditions of the Certificate of Approval by the Contractor. His / Her duties in this regard will include, *inter alia*, the following:

- Confirming that the Certificate of Approval and all permits required in terms of the applicable legislation have been obtained prior to the activity commencing.
- Monitoring and verifying that the ESMP and Conditions of approval in the Certificate are always adhered to and taking action if environmental and social specifications are not followed, issuing fines if and when necessary.
- Monitoring and verifying that environmental and social impacts are prevented or kept to a minimum.
- Reviewing and approving method statements, to ensure that the environmental and social specifications contained within this ESMP and Certificate of Approval are adhered to;
- Inspecting the site and surrounding areas on a regular basis with regards to compliance with the ESMP and Certificate of approval.
- Monitoring the undertaking by the Contractor of environmental and social awareness training for all new personnel on site during construction and for maintenance activities during operation.
- Ensuring that activities on site comply with all relevant environmental and social legislation.
- Ordering the removal of, person(s) and/or equipment not complying with the specifications of the ESMP and/or Certificate of approval.
- Undertaking a continual internal review of the ESMP and submitting any changes to REG and/or RDB and the concerned Lead Agencies (in case of major changes) for review and approval.
- Checking the register of complaints maintained and ensuring that the correct actions are/were taken in response to these complaints.
- Liaise on a monthly basis with the relevant Local Grievance Redress Committees, and higher-level Grievance Redress Committees, as necessary.

- Checking that the required actions are/were undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to the management of REG.
- Conducting monthly environmental and social performance audits in respect of the activities undertaken relating to the project.
- Keeping a photographic record of progress on site during construction from an environmental and social perspective.
- Recommending additional environmental and social protection measures, shall these be necessary; and
- Providing report back on any environmental and social issues at site meetings.

The REG Environmental and social Specialists and/or appointed E&S Supervising Consultant must have:

(i) A good working knowledge of all relevant environmental and social policies, legislation, guidelines and standards both locally in Rwanda and internationally.
(ii) ii) The ability to conduct inspections and audits and to produce thorough, readable and informative reports.
(iii)The ability to manage public communication and complaints.
(iv)The ability to think holistically about the structure, functioning and performance of environmental systems; and
(v) Proven competence in the application of the following integrated environmental management tools (including, Environmental and Social Impact Assessment, Environmental and Social Management Plans/Programmes, Environmental and Social Auditing, mitigation optimization of impacts, Monitoring and Evaluation of Impacts and Environmental and Social Management Systems).

The REG Environmental Specialist and/or appointed E&S Supervising Consultant/s must be fully conversant with the ESMP and Certificate of Approval (once considered and issued) for the proposed construction of the transmission line and ensure compliance with all relevant national environmental legislation and international good practices.

7.5.3 Contractor's Role

The Contractor is responsible for constructing the power lines, within the conditions of the ESMP and is liable to pay fines for transgressions and non-compliance with the provisions of the ESMP. The construction Contractor must, in line with this ESMP, prepare a document clearly outlining and demonstrating the environmental and social responsibilities, accountability and liability. The Contractor shall assign responsibilities for the following:

a) Documenting the required environmental and social policy and strategy;
b) Respond to all environmental and social aspects which require action, under the core elements and sub-elements of the ESMP through compiling E&S Action Plans;
c) Overall design, development and implementation of the Method Statements;
d) Reporting structures;
e) Actions to be taken to ensure compliance; and
f) Implementing the ESMP in all stages/phases of the transmission line project.

All official communication and reporting lines including instructions, directives and information shall be channeled according to the organizational structure developed by the Contractor and approved by the REG Environmental and social Specialist and/or E&S Supervising Consultant/s. The Contractor will provide for personnel to deal with stakeholder liaison and grievance procedures. The Contractor shall further:

a) Be responsible for the finalization of Action Plans and Method Statements under the ESMP, prior to project commencement where necessary, which through being implemented will achieve the environmental and social specifications contained within the ESMP and the relevant requirements contained in the Certificate of Approval, once/if issued by RDB;
b) Be responsible for the overall implementation of the ESMP in accordance with the requirements of REG and the Certificate of Approval, once/if issued by RDB;
c) Ensure that all third parties who carry out all or part of the Contractor's obligations under the Contract, comply with the requirements of this ESMP; and
d) Work closely with the REG E&S Specialist and/or the E&S Supervising Consultant/s.

7.5.4 Role of REG Environmental Officer and External E&S Supervising Consultant

REG, as the proponent of the project, is responsible for putting in place an Environmental and Social Officer, with the option to appoint an external Environmental & Social (E&S) Supervising Consultant/s, to provide the required support for the duration of at least the construction phase of the project. The E&S Officer must monitor and report on compliance with the project approvals and the provisions of the ESMP. In the case of an external E&S Supervising Consultant/s being appointed, such can act as an independent assessor, auditor and authority on issues of compliance on the Project Site, as required by REMA and reporting directly to REG and REMA, as well as other key stakeholders.

The E&S Officer has the right to issue a stop order on work and/or non-compliance fines, if non-compliance on the part of the Contractor is resulting in significantly detrimental environmental and social impacts.

The intervals at which E&S audits shall be undertaken shall be agreed upon by REG, the Contractor, E&S Supervising Consultant/s and REMA. It is suggested that at least quarterly audits, and more regular monthly site monitoring, if necessary, be conducted and reported, with annual audits, and final audit upon completion of the construction phase. An E&S audit programme should be put in place for the project, to manage the audits and make sure compliance monitoring remains on track. The environmental audit programme shall at least include the following:

a) A comprehensive quarterly and annual E&S audit will be undertaken, as well as a final completion audit at the completion of the construction phase to verify compliance with the ESMP, Certificate of Approval and all applicable environmental legislation. An audit report shall contain recommendations on E&S management activities which are required to be implemented within the subsequent phase. The auditor shall report concurrently to the Contractor, REG and REMA;
b) Periodic environmental audits to be undertaken during the operations phase to verify ongoing satisfactory environmental management performance. These audits must be followed up with appropriate remedial and corrective actions as shall the audit findings

demonstrate any non-conformance or non-compliance with the specifications of the ESMP; and

c) Compile and agree on (together with REG) a template for the audit report, prior to the commencement of the project.

7.5.5 RDB and REMA's Role

RDB is responsible for the consideration of the application, to either approve or deny the project. If the project is approved, then RDB is responsible for issuing a Certificate of Approval whereas REMA is responsible for monitoring compliance with the conditions of approval through different inspection and enforcing the compliance to the prepared ESIA Report.

7.5.6 District

District authorities and their respective local government structures in the 2 Districts (Ruhango and Muhanga) that are traversed by the proposed power lines will be vital in the implementation of the project by mobilizing political goodwill and sensitizing communities on the project. In addition, the District's Vice Mayors for Economic Development, and Social Affairs, as well as the District Environment Officers (DEOs) and their counterparts at Sector level will be responsible for reviewing and monitoring the implementation of the environmental and social aspects of the project in their area of jurisdiction. The Vice Mayors and Sector Executives as well as the District Electricity Maintenance Engineers (DEs), DEOs in the respective areas of project implementation will monitor the project to ensure that mitigation measures are adequate and are well integrated in the overall project implementation framework. The DEs, DEOs and CDOs can also review this report and provide comments to REMA, prior to final decision by REMA.

The role of the DEOs will also be to ensure that the proposed project is implemented in accordance with RDB conditions of approval. They will also attend the site inspection and project meetings and be able to point out issues of concern. Specifically, they will oversee implementation of compensation aspects wherever these may arise and other social issues such as complaints.

7.5.7 Local Communities

The local communities play an important role in the final design and construction phases. During the ground-truthing of the final designs, Project Affected Persons (PAPs) can give further input into the specific placement of towers and the proposed route, where it affects them directly. Woodlots and crops that are damaged and/or lost due to the project must be dealt with in the RAP. Local communities also have an important role to play in compliance monitoring, to make sure to report any non-compliance issues or concerns to the Local Grievance Redress Committee, DEO, E&S Supervising Consultant, REG, REMA and/or the World Bank.

7.5.8 Other Key Stakeholders

Other key stakeholders relevant for the monitoring of health, welfare and education all play an important role of keeping watch on the project, to all contribute in meaningful ways to the monitoring of the impacts, as well as engaging fully with key issues, to better manage undesirable consequences resulting from infrastructure projects throughout Rwanda.

7.5.9 Physical Cultural Resource (PCR) and Chance Finds Procedure

Chance find procedures under this Project will be designed as follows:

- Immediate Stop the construction activities in the area of the chance find.
- Delineate the discovered site or area.
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities take over. The Institute of National Museum of Rwanda shall be responsible for significant movable and immovable cultural property that pertains to Rwanda history, heroes and the conservation of historical artifacts and the National Museum shall be responsible for significant movable and immovable cultural and natural property pertaining to collections of fine arts, archaeology, anthropology, botany, geology, zoology and astronomy, including its conservation aspect. Institute of National Museum of Rwanda Cultural Properties Division take over. The address of Institute of National Museum of Rwanda is as follows:
- Rwanda, Huye
- Address: SH 1RD 2
- P.O.BOX 6397, Kigali
- +250730741093
- +250783379597
- E-mail: info@museum.gov.rw
- Notify the supervisory Engineer who in turn will notify the responsible local authorities and the Institute of National Museum of Rwanda Cultural Properties Division immediately (less than 24 hours).
- Contact the responsible local authorities and the Institute of National Museum of Rwanda Cultural Properties Division who would be in charge of protecting and preserving the site before deciding on the proper procedures to be carried out. This would require a preliminary evaluation of the findings to be performed by the archaeologists of the Institute of National Museum of Rwanda Cultural Properties Division (within 72 hours). The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage, including the aesthetic, historic, scientific or research, social and economic values.
- Ensure that decisions on how to handle the finding be taken by the responsible authorities and the Institute of National Museum of Rwanda Cultural Properties Division. This could include changes in the layout (such as when the finding is an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage.
- Implementation for the authority decision concerning the management of the finding shall be communicated in writing by the Institute of National Museum of Rwanda Cultural Properties Division; and
- Construction work will resume only after authorization is given by the responsible local authorities and the Institute of National Museum of Rwanda, Cultural Properties Division concerning the safeguard of the heritage.
- These procedures must be referred to as standard provisions in construction contracts, E&S risk management Procedures for Inclusion in the Technical Specifications for Contracts.

During project supervision, the Site Engineer in collaboration with the contractor E&S risk management team shall monitor the above regulations relating to the treatment of any chance find encountered are observed.

- Relevant findings will be recorded by the E&S team and will be reported in monitoring and Evaluation Report on quarterly basis to the World Bank, and Implementation Completion Report on E&S risk management part will assess the overall effectiveness of the project's cultural property mitigation, management, and activities when the chance find encountered during the implementation.

7.5.10 Implementing the ESMP

The Environment and Social Management Plan (ESMP) must be implemented on condition of approval, with full compliance, to enhance positive impacts and avoid significant negative impacts. The mitigation measures and estimated implementation costs are detailed in this ESIA Report and reporting on actions taken is required on a regular basis.

The mechanism of how to monitor, audit, report and action interventions, is detailed in this ESIA Report.

The costing for the implementation of the ESMP remains indicative, depends on how the project is implemented and will need to be further accurately estimated once the project is divided into implementable sections, or upon appointment of the construction Contractor, as applicable.

The 1st step in implementing the ESMP is for the REG Environmentalist to drive environmental and social, monitoring, compliance auditing and intervention. The appointment of an external and independent Environmental and Social (E&S) Supervising Consultant/s can assist in fulfilling this role.

Table 24: Environmental and Social Management Plan (ESMP) for the 110 kV Transmission Line

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
General Provisions					
All impacts	a. Achieve full compliance with the World Bank Environmental and Social Framework (ESF) b. ESMP is based, through regularly monitoring and address on- site situations and through applying the relevant mitigation measures. c. The Environmental and social Specialists can issue penalties, in consultation with relevant authorities, for d. incidents of non-compliance, and always in liaison with REMA. e. The contractor shall develop the site-specific Contractor environmental and social management plan (C-ESMP) which will detail management of all issues on site including waste disposal and management, source of local material and management of transportation, personnel at site, expected quantity of waste to be generated and how it will be managed, all sub-plans shall be included in CESMP under the section of Management Strategies Implementation Plans (MSIPs). **Notes:** The sub-project impacts mitigation measures have been analyzed and shall be assessed prior to the project	Entire Line routes	REG-EDCL	REG /EDCL Environmental Specialist in place. Dedicate the DEO for the project	-

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
	implementation and the conflicts between the mitigation have been considered in different sections of this ESIA. **As the project is still under tender process, the C-ESMP shall detail all the following:** quantities of materials needed during construction and operation, clearly indicated e.g. water, power, lubricants, raw materials, ore, structural components, fill, source of materials, impacts of transportation of all materials, personnel and visitors, means of transporting materials, products, workers, timeline for construction, operation, decommissioning and closure.				
All impacts	a. Sensitize all Contractors, including foremen, supervisors and workers in the requirement for and full implementation of the C-ESMP. b. Employ an adequately qualified and experienced Environmental Officer to assist with specific route and tower location of the infrastructure, prior to the construction of such, as well as regular independent monitoring throughout the construction and rehabilitation stages of the project. c. Put in place simple Construction Method Statements for activities in sensitive areas, like wetland areas, forest reserves, areas with natural vegetation and densely populated areas.	Entire routes	Contractor	REG/EDCL Environmental Specialist in place. Dedicate the DEO for the project	13,000

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
PRE-CONSTRUCTION PHASE					
Community expectations from the project	a. To organize workshops for information and awareness raising for authorities, community-based organizations/ NGOs and communities at all levels (national, districts and sectors) b. To produce and distribute/disseminate information tools by considering concerns of communities in all communication channels.	Communities located near RoW of each transmission line / substation	REG Project Implementation Unit (PIU) in collaboration with REMA	- REMA. - Self-monitoring - by REG/EDCL	10,000
Planning of environmental management requirements	• Preparation of Contractor's environmental management plans. • A drainage and erosion control plan; • A rehabilitation plan for disturbed areas; A waste management plan; • An intervention plan in case of spillage of contaminants. • A fuel and other hazardous materials management plan.	All building sites and all activities	Contractor	- REMA. - Self-monitoring by REG/EDCL	To be part of the Contractor budget
Authorization for clearing RoW and license to borrow construction materials	• To obtain authorizations from owners and authorities before proceeding with clearing of RoW. • To use only authorized quarries and recognized suppliers of sand, gravels and quarry materials. To respect all requirements of authorizations. • To apply by writing for an authorization to operate a borrowing from landowners with prior commitment to rehabilitate borrow areas to SESO.	In all RoW and work sites	Contractor	- REMA. - Self-monitoring by REG/EDCL	Is part of works to be executed by Contractor

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
Sources of supply of construction materials	To identify and use quarries recognized by State (quarry materials, gravels and sands).	The riparian area of RoW	Contractor	- REMA. - Self-monitoring by REG/EDCL	Is part of works to be executed by Contractor
Visual quality of landscape	• In case the visual quality of landscapes is affected, to plant tree hedges to camouflage the RoW. • To avoid as much as possible the location of pylons on mountain ridges or vegetation-free hilltops.	Particularly specified places with tourism potential	Contractor	- REMA; - Self-monitoring by REG/EDCL	Is part of the works to be executed
Establishment of worksites and temporary construction site areas	• Before installing worker camps or other work areas, the Contractor shall submit its location to the SESO for approval. The SESO will ensure that the landowner has given his agreement and that the environmental management measures will be introduced. • To grant relevant landowners' compensation for their assets and rental of land for duration of works. • To prepare development plans for basic campsites and other construction sites and have them approved by SEO. • To plan safe discharge of all wastes, avoid spillage, leakages of soil pollutants and water resources of receipt tanks. • The Contractor will be responsible for payments of all costs generated for clean-up of pollutions caused by his	Construction campsite, landowners and riparian communities of all RoWs	Contractor	- REMA. - Self-monitoring by REG/EDCL	Is part of works to be executed by Contractor

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
	activities and will have to fully compensate relevant people. • Supply drinking water and maintain its quality and ensure sanitation and discharge of wastes from construction sites. • Consider facilities of access to existing public infrastructure (roads, drinking water supply, electricity and communication cover. • Consider topography and site soil quality, its location in regards with a wetland (250m). • Provide to SEO for approval a campsite plan with indications of its limits and an environmental management plan for site (capacity of campsite in number of people, solid waste and wastewater, drinking water and electricity supply, etc.).				
CONSTRUCTION PHASE					
Soils erosion and compaction	• Restrict the activities to the minimum possible; • Use appropriate machinery and/or protective • boarding during soil stripping; • Remove and stockpile topsoil, subsoils and any parent material separately; • Use the stockpiled material in the origin area; • Topsoil storage periods shall be kept to a minimum.	All RoWs	Contractor/ REG	- REMA; - Self-monitoring - by REG	Included in the project budget

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
Changes of landscape - Visual impact	• Use paint with colors that match the environment to minimize visual impact of the structure; • Retain a belt of trees/bush around facilities built to minimize visual impact.	All RoWs	Contractor	• **REMA;** • **Self-monitoring by REG**	2,500
Noise and Vibration	• Restrict construction and operation of heavy machines to daylight; • Ensure noise emissions are kept within the • Rwanda standards; • Reduce needed truck movements by careful planning of needs of construction material; • Regular and effective equipment maintenance in order to ensure all machinery is in good working order and use does not generate excess noise/vibration. • Etc.	All RoWs	Contractor	• **REMA;** • **Self-monitoring by REG/EDCL,** • **District authorities**	2,500
Loss of vegetation cover and plant diversity	• Align access tracks with existing roads and tracks • in order to minimize the loss of vegetation cover; • In areas of dense vegetation cover, the removal of vegetation must be restricted to the minimum necessary width; etc.	All RoWs	Contractor	• **REMA,** • **Self-monitoring by REG/EDCL**	4,000

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
Disturbance and mortality of terrestrial fauna	• Restrict construction activities to daylight hours; • Inspect the area to be cleared for any terrestrial fauna before bush clearing and digging; • Protect any trench left overnight with a net fence to block fauna from being trapped inside; • Capture and release fauna away from the direct influence zone (including species trapped in the trenches);	All RoWs	Contractor	**- REMA,** **- Self-monitoring by REG/EDCL**	5,000
Disturbance of Surface Water	- Zero liquid effluent during normal operation.	All RoWs	- Contractor/ REG	- REMA, - RWB, - Self-monitoring by REG/EDCL	
Liquid waste management	• All wastewaters must be contained on site; • Consider reuse, recycling, and treatment of process water where feasible • The quality and quantity of wastewater discharged in the environment, including storm water be managed and monitored and be of adequate quality prior to release;	All RoWs	- Contractor/ REG	• REMA, Self-monitoring by REG/EDCL	6,000

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
Air Quality Management	• Minimizing dust from open area sources, including storage piles; • Dust suppression techniques should be implemented, such as applying water or non- toxic chemicals to minimize dust from vehicle movements, • Managing emissions from mobile sources, • Avoiding open burning of solid.	All RoWs	- Contractor/ REG	- REMA, - Self-monitoring by REG/EDCL	Operational costs
Solid wastes management	• Waste Prevention: Processes should be designed and operated to prevent, or minimize, the quantities of wastes generated and hazards associated with the wastes generated • Implementation of recycling plans. • All the solid waste should be collected; the biodegradable organic material composted properly on site for manure production and the non- biodegradable disposed of in a public landfill; etc.	All RoWs	- Contractor/ REG	• REMA, • Self-monitoring by REG/EDCL	3,000
Water Resource depletion	• Environmental conservation education to all communities living closer to water sources • Facilitation of formation and maintaining community based environmental conservation clubs. • Development of Water Resources management plan • Preparation of Climate Change adaptation measures ,	All RoWs	• REG/EDCL, • REMA,	- REMA	5,000

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
Management of Hazardous Materials and Oils	• Waste separation must be conducted on site; • Develop policies and programmes for waste management, storage, recycling and minimization;	All RoWs	- Contractor	• REMA, • Self-monitoring by REG/EDCL	3,000
Safety and Security	a) Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the construction site; b) Measures to prevent and control OHS issues during the construction, maintenance and operation of the project should adhere to established national and international OHS guidelines that are specific for electricity distribution line projects. These measures should also have site- specific targets and an appropriate timetable for achieving them, as related to: – The Contractor should have on site an Occupational Safety and Health Policy and Action Plan addressing workers and PAPs on occupational safety and health issues, workplace conditions, welfare, accidental electrocution, hazardous waste management, general safety requirements, fire preparedness, machinery, plant and equipment, etc. in line with the Occupational Safety and Health Regulation	All RoWs	- Contractor	• REG/EDCL, • District authorities	2,000

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
	– The Contractor should conduct HSE sensitization with PAPs directly affected by the project; – The Contractor should have HSE induction for all workers, and undertake daily tool box meetings prior to works; and – Workers should regularly be taken through safety drills and emergency preparedness training allowing for quick and efficient responses to accidents that could result in human injury or damage to the environment. c) The Contractor should involve local leaders in labour recruitment to ensure that people hired have no criminal record, to avoid hiring less desirable employees. d) The local content provision should be emphasized to minimize labour requirements needed from outside the community, as these are locally associated with safety concerns.				
Health related issues due to dust emissions	• Use of wet processes. • Use of Personal Protective Equipment	All RoWs	Contractor/	• REMA • REG/EDCL	4,000

Social cohesion or disruption & Influx of people	a. The Contractor should be monitored independently and regularly to ensure strict compliance with contractual obligations, including adherence to stipulated standards of conduct and behaviour of construction workers. b. The Contractor needs to sensitize workers in cultural values and norms of the area and the identified sensitivities c. The Contractor needs to work closely with the existing law enforcement agencies in the areas of the project (Local Councils and the Police) to help address potential issues of crime in the project. Local authorities require support to handle the increased cases of indiscipline and conflict, brought about by the increased population influx, and any disputes that are likely to ensue. d. Issues of security should be handled hand-in-hand with the local Council administration, to ensure that suspicious non- known members of the area who are also not part of the project, are rounded up to avoid disrupting the security of the area. e. The project should in addition have its own security system as it is very common to find the local security organs conniving with the bad characters to exploit projects. f. A comprehensive HIV/AIDS Awareness and Management Plan must be implemented throughout and for the duration of the construction phase, with post-	All RoWs	Contractor	**REMA REG/EDCL Local authorities**	5,000

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
	completion monitoring and reporting to REG and REMA, collaborating with NGOs and CBOs, as possible.				
Human health	a) A key consideration for the proposed project is the ability to effectively involve key stakeholders in a realistic and positive participatory process to combat gender violence and the abuse and mishandling of women and children on such government infrastructure projects and the Contractor must present a plan to address such; b) A comprehensive HIV/AIDS Awareness and Management Plan must be implemented throughout and for the duration of the construction phase, with post-completion monitoring and reporting to REMA, collaborating with NGOs and CBOs, as possible. c) Sensitization of communities to be conducted and include electromagnetic fields, accidental electrocution, exposure to hazardous waste materials like fuels, oils and timber offcuts with creosote, safe levels of exposure and related impacts, to avoid speculations	All RoWs	Contractor	REG/EDCL, REMA. Local Authorities	3,000

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
Gender impacts	a) Conducting appropriate sensitization on gender issues at all levels within the Project Area and creation of awareness on the responsibility of all concerned during the various phases of the project to address specific gender concerns. This should entail consultation with both women and men in the Project Area and within the construction teams. b) REG and the Contractor should ensure that: – effective gender responsive and equality activities under the proposed project are duly defined and implemented through participatory engagement. – the quantifiable and nonquantifiable, gender and social mitigation measures related to direct and indirect impacts are achieved; and – a social specialist is deployed on the project to oversee among others, gender mainstreaming in the project cycle, is implemented. c) HIV/AIDS awareness campaigns must be regularly conducted for workers and local communities, as well as activities promoting access to health services, treatment and counselling.	All RoWs	Contractor / REG	**REG/EDCL, REMA. Local Authorities**	1,000
Vulnerable groups	a) A Child Protection Plan will be developed and provided to all the Contractors and school management to discourage the Contractors from using children as laborers. In addition,	All RoWs	Contractor / REG-EDCL	REG/EDCL, REMA. Local Authorities	2,000

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
	Contractors will be required to avoid employing workers who are below eighteen years old. They will also be required to keep records that show the ages of their workers. b) Ensure that the community and local leadership have access to and know of and report abuse using the national child abuse hotline 116. The existence of the hotline can be displayed throughout near the construction site and in the community at large. c) The Contractor should ensure that mechanisms for close monitoring of worker's behaviour/conduct are in place e.g. Contractor could discreetly engage the police to identify anonymous informers from among the workers to monitor and report any negative behavior by the workers including child abuse related misconduct, display a call line or suggestion box where the community can provide feedback on workers behaviour. d) REG and the Contractor should ensure that all local leaders and women/child representatives are fully oriented to the labour force related risks for children engaging in construction related activities.				

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
	e) Talks with the Contractor and his workforce by relevant officials (including the police) on child protection should be encouraged and appropriately scheduled, including continuous popularization of the child help line 116. Parents/guardians should be sensitized and held accountable for children leaving and arriving home before dark. f) Conducting appropriate sensitization on gender issues at all levels within the Project Area and creation of awareness on the responsibility of all concerned during the various phases of the project to address specific gender concerns and especially as they relate to women. This should entail consultation with both women and men in the Project Area and within the construction teams. g) HIV/AIDS awareness campaigns for workers and local communities and activities promoting access to health services, treatment and counselling h) REG/EDCL and the Contractor should ensure strict compliance with the provision of relevant safeguard compliance with respect to				

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
	persons with disabilities. REG, REMA and the Contractor should ensure that there is full and effective participation of persons with disabilities and other vulnerable groups, like children and through representative organizations, in all phases **Crime and community safety:** **Security Measures**: • **Fencing and Gates**: Secure the site with sturdy fencing and controlled access gates to prevent unauthorized entry. This can be supplemented with warning signs around the perimeter. • **Lighting**: Install adequate lighting to deter criminal activities at night and ensure that dark areas are minimized. • **Surveillance**: Use CCTV cameras to monitor the site, especially in areas where valuable materials are stored. This can act as a deterrent and help law enforcement in the event of a crime. • **Security Personnel**: Employ security guards to patrol the site, particularly during non-working hours. Guards can check for unauthorized access, vandalism, or theft.				

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
	Inventory Management and Equipment Tracking: • Implement inventory control measures, such as logging equipment and materials, to track their movement on and off the site. • Use GPS tracking on high-value equipment to locate stolen items or monitor unauthorized usage. **Access Control**: • Ensure that only authorized personnel have access to the site. This can be achieved through ID badges, biometric scanners, or digital keycards. • Secure storage areas where tools and equipment are kept, using locked containers or enclosed storage facilities. **Community Engagement**: • Hold meetings or outreach sessions with the local community to inform them about the construction timeline, activities, and safety precautions. This helps build trust and encourages the community to report suspicious activities. • Maintain clear communication channels (hotlines or community liaison officers) for the				

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
	public to report issues related to the site, such as safety concerns, noise disturbances, or criminal activities. **Safety Barriers and Signage**: • Use physical barriers, such as cones, bollards, and temporary walkways, to protect the public from hazardous areas, particularly in locations with high pedestrian traffic. • Install proper signage to warn both workers and the public of potential dangers, such as falling objects, open pits, or active machinery.				
Issue of the destroyed environment like roads access, temporary campsite, debris of materials, unused pits, etc.	• The site rehabilitation plan shall be part of CESMP, and the plan shall detail the activities to be undertaken to rehabilitate the damaged environment • The contractor shall prepare Management Strategies Implementation Plans (MSIPs) detailing the sub-plans and implementation timelines as this ESIA shall be the reference document to inform the design, this shall be done and approved by the consultant. • Regular inspection to each tower shall be organized and coordinated by the Environmentalist from the project proponent.	To all towers location	REG-EDCL,	Quarterly basis and at the completion of the project	TBD

Environmental concerns	Suggested Mitigation Measures	Location	Responsible	Monitoring	Estimated cost (USD)
OPERATION PHASE					
Animal biodiversity	• To undertake regular monitoring of bird collisions at wetland crossings (particularly Rugeramigozi and Urugondo) during operation of the line.	• Wetland crossings	REG/EDCL in collaboration with REMA and RFA	REMA; RFA • Self-monitoring by REG	4,100
Vegetation control	• The RoW will require regular maintenance to control vegetation of the RoW under conductors and in substations • Maintenance operations will have to be restricted to the RoW and should not damage the surrounding vegetation. • During maintenance and RoW clearance, ensure that vegetation is cut up to a certain height that allows animals to cross on both sides. Leave in place the shrub layer • The manual or mechanical control of vegetation within the RoW must be encouraged. To undertake tree removal mechanically and not to use phytocides to control vegetation. • To sign a maintenance contract with an local association/cooperative in order to ensure mechanical	• In all the RoW and substations	• Project implementation • Unit (PIU)	• REMA; • Self-monitoring by REG/EDCL	As part of the Operation and maintenance costs
Total Costs					**75,100**

Total project cost: USD 6.25 million

Total ESMP implementation cost: USD 75,100 (1.2% of the total project cost)

7.5.11 The Potential Interactions Between the Project and the Resources and Receptors

Activity/Aspect/Receptor **Aspect Key:** **An interaction:** **- that may have a positive impact with implementation of Project-embedded and ESIA-defined mitigation (Green)** **- that is unlikely to have an interaction or of minor consequence (White)** **- that may have a significant negative impact (Orange)**	**Environmental and Socio-economic Aspects**															
	Physical / Biological										**Socio-economic**					
	Air Quality and Climate Change	Noise and vibration	Surface water quality	Groundwater quality	Geomorphology and Soil quality	Visual Landscape	Habitats	Flora	Fauna	Ecosystem Services	Displacement	Demography, cultural & local society	Local Economy	Community H&S	Infrastructure and Services	Cultural heritage
Pre-Construction Phase																
Land acquisition and land access																
Construction Phase																
Site preparation works: land clearance and earthworks																
Land occupation (permanent + temporary)																
Use of vehicles and heavy machinery																
Masonry and concrete works; steel works, electrical/power																
Presence of workers (including recruitment and influx)																
Waste production and management																
Water abstraction and use																

Activity/Aspect/Receptor **Aspect Key:** **An interaction:** **- that may have a positive impact with implementation of Project-embedded and ESIA-defined mitigation (Green)** **- that is unlikely to have an interaction or of minor consequence (White)** **- that may have a significant negative impact (Orange)**	**Environmental and Socio-economic Aspects**															
	Physical / Biological										**Socio-economic**					
	Air Quality and Climate Change	Noise and vibration	Surface water quality	Groundwater quality	Geomorphology and Soil quality	Visual Landscape	Habitats	Flora	Fauna	Ecosystem Services	Displacement	Demography, cultural & local society	Local Economy	Community H&S	Infrastructure and Services	Cultural heritage
Materials abstraction and transport (aggregates, steel, timber, use of quarries)																
Landscaping works																
Demobilisation of construction front																
Operation Phase																
Solid waste/wastewater management																
Utilities operation (lighting, electricity, running water)																
General maintenance services																

Figure 15: Interactions of potential sources of impact and potential receptors

The matrix displays generic Project activities (through entire life cycle) against resources/receptors in support of a preliminary identification of the potential interactions each activity may have on the range of resources/receptors.

This exercise allowed the preliminary identification of potential interactions between Project activities and resources/receptors to develop generic conclusions as to the interactions likely to lead to significant effects.

This exercise is to be performed on case-by-case basis for each for each sub-component as part of the environmental and social impact assessment to allow identification of interactions leading to significant effects in each particular sub-component case.

The exercise performed indicated that while potential impacts would be expected for all Project phases, Project activities during the construction phase are typically expected to cause the majority of potential impacts. It also indicated that implementation of adequate mitigation strategy in line with the approach set forth in this ESIA may result in a number of **Positive Impacts** as discussed in this ESIA

A colour code was used to display the results of the performed analysis of Project activities - receptors interactions as indicated in the legend embedded in the matrix.

7.5.12 Impacts Characterization

At this stage, the characteristics of each impact are to be defined. Typical characteristics to be taken into account are:

Type (i.e. direct, indirect, induced);

Extent (i.e. local, regional or international);

Duration (i.e. temporary, short-term, long-term or permanent);

Scale or size (no fixed designations; typically numerical values e.g. affected area in ha, etc.);

Frequency (no fixed designations; typically numerical values e.g. number of occurrences in a given timeframe); and

Likelihood – only applicable in the case of unplanned events (i.e. unlikely, possible, likely).

7.5.13 Impacts Magnitude Designation

At this stage, the above-indicated characteristics are to be used to assign a magnitude to each sub-component's impact.

In essence, the magnitude defines the degree of change a given impact is likely to affect a resource/receptor. It is important that the magnitude designation is assigned in consistent manner across all considered impacts using same designations. Typical magnitude designations considered in the ESIA practice are:

Negligible;

Small;

Medium;

Large.

Given the diverse range of impacts to be considered and the variable relevance of potential impacts on the various resources and receptors, applied magnitude designation may include quantitative, semi-quantitative and qualitative methods applied on a case-by-case basis for each environmental and social aspect considered.

Quantitative methods can be applied when the effects can be expressed or measured in a numerical manner. Qualitative approaches require subjective description and typically require an increased professional judgement level as compared to the quantitative approaches.

7.5.14 Resources and Receptors Sensitivity/Vulnerability/Importance Definition

In addition to characterising impacts' magnitude, the definition of the sensitivity/vulnerability/importance of the impacted resource/receptor is the other principal stage in assessing the significance of impacts.

As impacted resources/receptors may be of different nature (e.g. physical, biological, cultural, human) there are various factors to be considered when defining the sensitivity/vulnerability/importance.

Such factors may include quality, sensitivity to change (e.g. for physical receptors like air or water), importance (e.g. local, regional, national, international in the case of a habitat or water body, or a cultural heritage value etc.), vulnerability (e.g. in the case of human or biological receptors etc.).

As in the case of magnitude it is important that sensitivity/vulnerability/importance designation is assigned in consistent manner across all considered impacts using same designations e.g.:

Low;

Medium;

High.

7.5.15 Evaluation of Impacts Significance

Once the magnitude of the impact and sensitivity/vulnerability/importance of the resource/receptor have been characterized, the impact significance shall be assigned for each impact.

The significance is typically designated with the consideration of the above indicated two factors, typically using an evaluation matrix similar to the one provided for exemplification purposes in below:

Table 25: Impact Significance Designation Matrix Example

		Sensitivity / Vulnerability / Importance of Receptor / Resource		
		Low	Medium	High
Magnitude	Negligible	Negligible	Negligible	Negligible

		Sensitivity / Vulnerability / Importance of Receptor / Resource		
		Low	Medium	High
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Source: ESIA, 2025.

Again, it is important that the employed significance designation is consistently applied to all considered resources/receptors, and all impacts to these resources/receptors.

Further, the above significance ratings are to be defined based on clear definitions indicating how these should be assigned. A possible set of such impact significance ratings to apply is provided below.

Table 26: Impact significance rating example

Significance Rating	Description
Negligible	Impact is of negligible significance if the resource/receptor (including people) will not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.
Minor	Impact is of minor significance if the resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small (with or without mitigation) and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. In either case, the magnitude should be well within applicable standards.
Moderate	Impact is of moderate significance if its magnitude is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a regulatory limit.
Major	Impact is of major significance if an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors.
Positive	There will be a beneficial impact to a resource/receptor. (Note: assigning significance to positive impacts not typically required).

Source: ESIA, 2025

7.6 Description of Environmental Effects of Mitigation Measures

1. Land Use and Vegetation Management

- **Mitigation Measure**: Clearing vegetation along the transmission line's right-of-way (RoW) and avoiding sensitive areas (such as forests, wetlands, and wildlife habitats) to minimize ecosystem disruption.
- **Environmental Effects**:
  - **Positive**: Targeted clearance helps preserve sensitive ecosystems and biodiversity hotspots. Restoring vegetation after construction can rehabilitate the environment and encourage ecosystem recovery.
  - **Negative**: Even with controlled clearing, some vegetation loss and habitat fragmentation may occur, which can lead to a reduction in biodiversity. Clearing vegetation may also contribute to soil erosion, particularly in areas with steep slopes, unless proper soil stabilization techniques are implemented.

2. Soil and Erosion Control

- **Mitigation Measure**: Employing erosion control methods, such as silt fences, erosion mats, and replanting disturbed areas, to prevent soil degradation.
- **Environmental Effects**:
  - **Positive**: Proper erosion control measures can prevent sediment runoff into nearby water bodies, protecting aquatic ecosystems and preserving soil fertility in agricultural areas. Re-vegetation after construction can restore soil stability and minimize long-term environmental degradation.
  - **Negative**: Temporary disturbances during the construction phase, such as heavy machinery operation, can cause soil compaction and localized erosion. If erosion control measures are not well-maintained, they can fail and lead to sedimentation in rivers and wetlands.

3. Water Resource Protection

- **Mitigation Measure**: Buffer zones near rivers and wetlands, careful planning to avoid water body crossings, and ensuring proper drainage systems are in place to prevent water contamination.
- **Environmental Effects**:
  - **Positive**: Buffer zones and proper drainage reduce the risk of polluting water sources. Avoiding sensitive areas like wetlands helps preserve aquatic habitats and maintain the natural flow of water bodies.
  - **Negative**: Drainage channels or altered water courses can sometimes change natural water flow patterns, potentially impacting downstream ecosystems. Construction near water bodies, even with precautions, can lead to accidental spills or increased sedimentation that affect aquatic life.

4. Wildlife and Habitat Protection

- **Mitigation Measure**: Design the transmission line route to avoid wildlife migration corridors, protected areas, and minimize tree felling in forested regions.
- **Environmental Effects**:

- **Positive**: Protecting critical wildlife habitats and migration paths reduces the risk of disturbing or displacing animal species. Habitat-sensitive construction techniques, such as using existing road networks or avoiding deforestation, help maintain biodiversity.
- **Negative**: Fragmentation of habitats may still occur, particularly if the transmission line crosses areas used by wide-ranging species. The construction noise and human presence could disrupt local wildlife temporarily, potentially leading to behavioral changes or displacement.

Avifauna and bats

- **Negative Impacts:** Collisions and electrocutions. Bats are vulnerable due to their flight patterns and echolocation behavior, which can be disrupted by overhead infrastructure.

Mitigation: Careful route selection and the implementation of bird-safe and bat-friendly line designs (e.g., bird diverters).

5. Air Quality Control

- **Mitigation Measure**: Using dust suppression techniques (e.g., water spraying on dirt roads) and ensuring that construction vehicles meet emission standards to reduce air pollution.
- **Environmental Effects**:
  - **Positive**: Dust control reduces particulate matter in the air, which can benefit both the local community and nearby ecosystems. Lower emissions from equipment reduce air pollution, limiting impacts on human health and contributing to better overall air quality.
  - **Negative**: Increased water use for dust suppression may strain local water resources, particularly during dry periods. Emissions from construction equipment, even with mitigation, can still contribute to localized air pollution, affecting both the environment and nearby residents.

6. Noise and Vibration Reduction

- **Mitigation Measure**: Limiting construction activities to certain hours and using noise-dampening equipment to minimize disturbances to nearby communities and wildlife.
- **Environmental Effects**:
  - **Positive**: Reducing noise pollution during construction can minimize its impact on local fauna, particularly sensitive species such as birds and mammals that rely on sound for communication and navigation. It also limits disturbances to local residents, improving community relations.
  - **Negative**: Despite mitigation, temporary increases in noise and vibrations may still occur, potentially disrupting wildlife, especially in protected areas or habitats near the construction zone.

7. Waste Management

- **Mitigation Measure**: Implementing proper waste disposal practices, including recycling construction materials and handling hazardous waste in accordance with environmental regulations.
- **Environmental Effects**:

  - **Positive**: Proper waste management reduces the risk of contamination of soil and water, protecting the environment and human health. Recycling and reusing materials help reduce the environmental footprint of the project.
  - **Negative**: Mismanagement of waste, particularly hazardous materials (e.g., oils, chemicals), could lead to contamination of soil and water sources, affecting wildlife and human communities. In some cases, waste disposal activities may still generate pollution, such as greenhouse gas emissions from transportation to recycling or disposal sites.

8. Socio-Economic and Community Impact

- **Mitigation Measure**: Engaging local communities, ensuring fair compensation for land take, and promoting job creation during the construction phase.
- **Environmental Effects**:
  - **Positive**: Community engagement can improve local understanding of the project, reducing resistance and fostering cooperation. Employment opportunities and fair compensation for land take can improve local livelihoods, reducing economic pressures on surrounding natural resources (e.g., illegal logging or over-harvesting).
  - **Negative**: The construction workforce may lead to an influx of temporary workers, which can increase demand for local resources (water, food, and fuel), potentially straining local ecosystems. There may also be indirect environmental impacts from increased human activity in previously undisturbed areas.

9. Transmission Line Corridor Maintenance

- **Mitigation Measure**: Regular maintenance of the transmission line corridor, including controlled vegetation management to prevent tree encroachment.
- **Environmental Effects**:
  - **Positive**: Regular monitoring and maintenance can prevent future environmental degradation, ensuring the continued safety and sustainability of the transmission line. Controlled vegetation management can maintain the balance between operational safety and environmental protection.
  - **Negative**: Ongoing vegetation management (e.g., trimming or herbicide use) can lead to habitat degradation or the introduction of invasive species. Herbicides, if not properly managed, may have toxic effects on non-target species and contaminate water sources.

10. **Mitigation for GBV/SEA (e.g., Codes of Conduct, awareness campaigns, GRM):**

- Social backlash or stigma may occur if survivors or complainants are identified within small or close-knit communities, leading to marginalization or retaliation.
- Contractors may superficially comply with training requirements without internalizing behavior change, especially if monitoring is weak.
- In rare cases, the introduction of new reporting mechanisms may increase tension between workers and host communities if not properly communicated.

11. Mitigation **for Disease Transmission (e.g., health screening, awareness campaigns, sanitation):**

- Strict health screening may lead to exclusion or discrimination of workers who test positive for certain diseases, including stigmatization.
- Disposal of medical or sanitation waste (e.g., used PPE, testing kits) could pose environmental pollution risks if not properly managed.
- Frequent health campaigns may create "message fatigue" in communities, reducing the effectiveness of important communication over time.

12**. Mitigation of Child and Forced Labor (e.g., audits, age verification, reporting systems):**

- Strict enforcement may lead to loss of informal income for vulnerable families relying on adolescent labor, potentially pushing children into more hazardous or hidden forms of work.
- Families may resent enforcement measures, especially if there is no parallel livelihood support, leading to tension with project staff.
- Increased monitoring could cause privacy concerns or resistance from contractors, particularly in remote areas with limited oversight.

13. **Community Health and Safety**

Potential risks include increased traffic hazards, exposure to hazardous materials, accidents around construction sites, and noise and dust pollution, which may impact vulnerable groups like children, the elderly, and people with respiratory conditions.

- **Traffic Hazards**

During construction, the movement of heavy trucks and machinery increases the likelihood of road accidents, especially along narrow or poorly maintained local roads. The presence of construction vehicles may obstruct normal traffic flow and reduce visibility, increasing the risk of collisions.

To mitigate these hazards, contractors should develop and implement a Traffic Management Plan (TMP) in coordination with local authorities. This should include clearly marked detours, signage, speed limits, and the deployment of trained traffic marshals. Community awareness sessions and road safety campaigns should also be conducted to enhance local understanding of the risks.

- **Construction Site Risks**

Open excavation areas, high-voltage equipment, and moving machinery on construction sites pose direct physical risks to nearby community members, particularly curious children. Poorly secured construction zones may lead to accidental entry, injuries, or exposure to hazardous materials.

To address these risks, all construction zones should be securely fenced, clearly marked with warning signs, and access restricted to authorized personnel only. Contractors must also ensure that all hazardous materials are stored and disposed of in compliance with safety standards.

- **Positive Environmental Impacts**

Despite potential risks, construction activities can bring positive environmental and health-related outcomes if managed well. For instance, upgraded access roads may improve local mobility and access to health and social services. Temporary employment opportunities and health awareness campaigns initiated during the project can also contribute to better hygiene practices and increased health literacy in host communities.

- **Negative Environmental and Social Impacts**

On the other hand, improper handling of construction activities may result in negative environmental impacts, such as dust emissions, noise pollution, oil or fuel spills, and improper waste disposal, which can affect local air and water quality. These conditions can exacerbate existing health issues or trigger new ones in the community. **To mitigate** these effects, contractors must adopt environmental control measures, including dust suppression (e.g., water spraying), noise barriers, proper solid and liquid waste management, and regular environmental monitoring.

7.7 Grievance Redress Mechanism

7.7.1 Introduction

Article 33 and 34 of the Expropriation Law No 32/2015 of 11/06/2015 provides complaints procedures for individuals dissatisfied with the value of their compensation. Article 33 of the Expropriation Law stipulates that dissatisfied persons have a period of 10 days from the application for counter valuation by the person to be expropriated. This application should be done within 7 days after the approval of the valuation report by the expropriator.

7.7.2 Common Likely Types of Grievances and Disputes

In practice, grievances and disputes that are most likely during the implementation of a resettlement program are the following:

- Misidentification of assets or mistakes in valuing them
- Disputes over plot limits, either between the affected person and the Project, or between two neighbors;
- Dispute over the ownership of a given asset (two individuals claim to be the owner of this asset); e.g. due to recent change of asset ownership
- Disagreement over the valuation of a plot or other asset; and
- Successions, divorces, and other family issues, resulting in disputes between heirs and other family members, over ownership or ownership shares for a given asset.
- Lack of transparency in recruitment processes.
- Favoritism or exclusion in local hiring.
- Poor working conditions or wage disputes for local laborers.
- Excessive dust, noise, or vibration affecting homes and schools.
- Improper waste disposal near communities or farms.
- Water pollution or siltation affecting streams and irrigation.
- Concerns about increased traffic and risk of accidents.
- Spread of diseases or increased health risks from labor influx.
- Unsafe construction zones posing risks to children or vulnerable people.
- Incidents of GBV/SEA involving project workers.
- Harassment or inappropriate behavior by staff or contractors.

7.7.3 Grievance Redress Mechanism

7.7.3.1 Overview

Mostly project related grievances are site-specific. Often, they are related to impacts generated during implementation of the project such as property damage, interruption of utilities, disputes related to labor and working conditions, noise and pollution, expropriation and livelihood restoration related issues and GBV to name a few. Most of the time, they can be resolved easily on site with the contractor commitment to implement the ESMP and proper supervision by the implementing agencies and district local authorities.

The Grievance Redress Mechanism will be one of the methods put in place to monitor and resolve complaints that may arise during or after Project implementation by the affected people or other interested parties. Therefore, the project will receive, record, investigate and resolve all grievances throughout different implementation stages, following the provisions of Rwandan laws and the WB ESS 2, ESS10. Grievances shall be raised either informally or formally through existing channels or project specific grievance redress committees which will focus on grievances between the community and the project as described in Figure 16, while grievances among workers will be first handled by workers grievance redress committees to be established before the contractors can start works as provided in the Labor Management Procedures (LMP). Grievances shall be resolved at no cost to the complainant and in respectful manner, while specific cases shall trigger specific channels outside the project control. These include cases of Gender-Based Violence (GBV) which will be reported directly to Isange One Stop Center specialized providing a holistic package of support (medical, legal, forensic/investigation, psychosocial and safety needs to help victims of violence and child abuse, the majority of whom are women and girls). Prevention measures such as awareness campaigns and engagement meetings with decentralized structures will be done to minimize GBV risks.

Complaints can be submitted either in person, by phone, text message, mail, e-mail or via a website.

7.7.3.2 Objective of Grievance Redress Mechanism (GRM)

Considering that the Grievance Redress Mechanism (GRM) works within existing legal and cultural frameworks, the Grievance Redress Committee (GRC) will comprise of local community representative, PAPs representative, women representative, local authority representative at village and cell levels, contractor and supervising firm representative.

Project-affected-people and any other stakeholders may submit comments or complaints at any time by using the project's Grievance Redress Mechanism (GRM) to the overall project management. The overall objectives of the GRM are to:

- Provide a transparent process for timely identification and resolution of issues affecting the project and people,
- Strengthen accountability to beneficiaries, including project affected people.

7.7.3.3 Processing

The grievance procedure at project level will be simplified and administered to the extent possible at the local levels to facilitate access, flexibility, ensure transparency, timely feedback and appeal.

Community grievances will be channeled via the Grievance Redress Committees (GRCs) purposely established for the project at the Cell, Sector and District levels. Stakeholders will be allowed to use any means easily accessible to them to voice their concerns and complaints such as filling a grievance form, sending an email, using phone etc. Information about the GRM will be publicized as part of the initial project consultations and disclosed in all the implementing

agencies. Brochures will be distributed during consultations and public meetings, and posters will be displayed in public places such as in government offices (cells, sectors and district offices), project implementation unit offices, digital platforms, notice boards available to potential stakeholders, etc.

Complaints will be filled in a Grievance Register that will be distributed to GRCs free of charge. After registration of the complaint, an investigation will be carried out by the committee members to verify its authenticity. Thereafter a resolution approach will be selected based on the findings. The decisions of the action to be taken will be communicated to all involved parties in verbal or written form.

All measures will be undertaken to ensure that the grievance is solved amicably between the concerned parties. If the grievance is not solved amicably, it will be escalated, it will be addressed at Cell level, Sector and District level in that order. If not successful in resolving the grievance at local administration level, the grievance would be escalated to the implementing entity's grievance unit and if unsuccessful at this stage, the grievance will be escalated to the Steering Committee of the project, if the grievance is beyond the Steering Committee capacity, the Courts of law will be the last resort. The grievance redress process is summarized in the figure below.

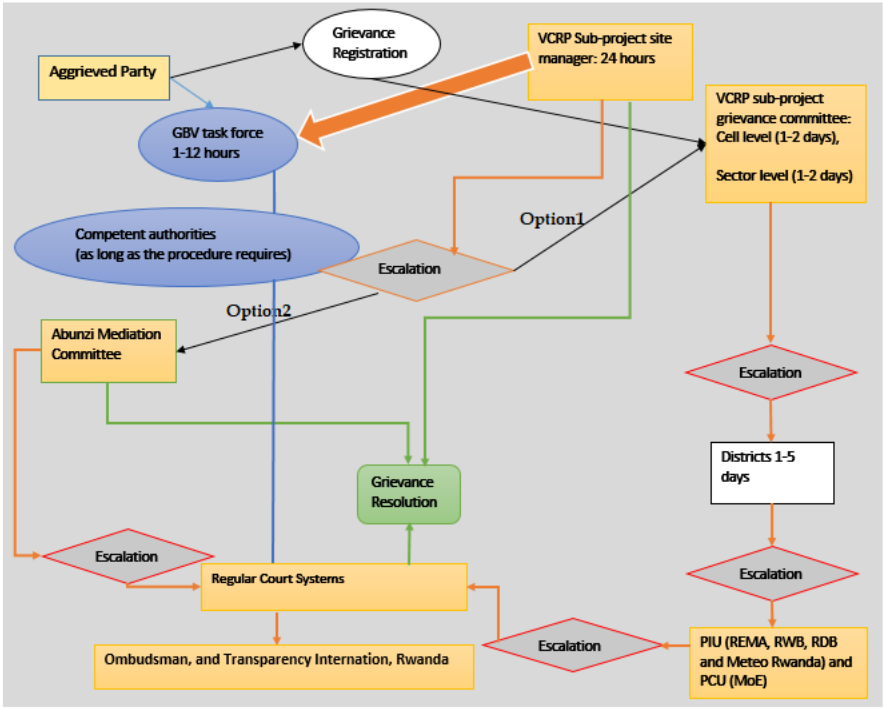

Figure 16: Grievance Redress structure for the implementation of the project

Table 27: Grievance Redress Process for the implementation of project

Stage	Process	Duration
1a	Since most complaints during the execution of works involve the contractor, at first the Aggrieved Party (AP) will take his/her grievance to the Site Manager (SM) of the relevant subproject who will endeavour to resolve it immediately. Where AP is not satisfied, the complaint will be transferred to the Sub-Project Grievance Redress Committee (GRC) at cell level. For complaints that were satisfactorily resolved by the SM, he/she will inform the GRC and the GRC will log the grievance and the actions that were taken. There is also a possibility that the AP directly takes his/her complaints to the GRC without going to the SM first. In this case, the GRC will solve it working with the SM.	**24 hours**
1b	The AP may choose to escalate the grievance to the Abunzi Mediation Committee especially if she/he is not directly linked to the sub-project.	**Not fixed**
2	On receipt of the complaint, the GRC at cell level will endeavour to resolve it immediately. In case the GRC at cell level fails to solve the complaint, it will be escalated to the GRC at Sector level. If unsuccessful, the GRC or the complainant then notifies District Authority.	**1–2 days at cell level 1–2 days at sector level**
3	The District Authority will endeavour to address and resolve the complaint and inform the aggrieved party. Grievances beyond their competency will be escalated to the PIU/EDCL.	**1–5 days**
4	If the PIU fails to resolve the complaint to the satisfaction of the complainant, he/she is free to refer the matter to the court.	**1–7 days**
5	For the matter related to GBV, the PAP will directly approach the representative of the National Women Council who is a de facto member of GRC to ensure her/his anonymity and safety. This GRC member has the responsibility to immediately inform the competent authorities (Rwanda National Police or Rwanda Investigation Bureau).	**Not fixed**

7.7.3.4 Grievance Redress Committee (GRC) and Composition

First, all interested stakeholders have developed a Grievance Redress Mechanism (GRM) for potential use. The aim of the grievance redress mechanism is to achieve mutually agreed resolution of grievances raised by such stakeholders. This grievance redress mechanism ensures that complaints and grievances are addressed in good faith and through a transparent and impartial process, but one which is culturally acceptable. As the GRM works within existing legal and cultural frameworks, it will be effectively implemented by a Grievance Redress Committee (GRC), which is organized in such a way that it will comprise of local community representative, PAP

representative, local authority representative at village and cell levels, EDCL/RUEAP and its safeguards.

As mandated by the law on gender equality, women will make up at least 30% of the GRC. All PAP representatives will be directly elected by their peers and the number of members may vary depending on the context and particularities of each sub-project site characteristics.

7.7.4 Description of Tasks and Day-to-day Responsibilities

- Receive unresolved complaints/grievance from RUEAP-EDCL and shall take over;
- The Grievance Redress Committee will log these in the Complaints Register and inform the Project Implementation Unit.
- The Grievance Redress Committee will keep a grievance Logbook and ensure that each complaint has an individual reference number and is appropriately tracked, and recorded actions are completed. The Log will contain record of the person responsible for an individual complaint, and records dates for the following events:
    - Date the complaint was reported.
    - Date the Grievance Log was added onto the project database.
    - Date information on proposed corrective action sent to complainant (if appropriate);
    - The date the complaint was closed out; and
    - Date response was sent to complainant.
- On receipt of the complaint, the GRC at cell level will endeavor to resolve it immediately. In case the GRC at cell level fails to solve the complaint, it will be escalated to the GRC at Sector level. If unsuccessful, the GRC or the complainant then notifies District Officials.

7.7.4.1 Response to Grievances

Response to grievance will be through the following channels.

- The same channel the complaint was submitted.
- Response to grievances should be handled in timely manner (according to the duration indicated for each tier), thereby conveying a genuine interest in and understanding of the worries put forward by the community.
- EDCL-REG should keep a record of complaints and results.

7.7.4.2 Monitoring of Grievances

All grievance activities should be monitored in order to verify the process. The following indicators should guide the monitoring process:

- Number of received grievances per month (Channel, gender, age, basic economic status of the complainants should be included)
- Type of grievance received (according to the topic of the complaint)
- Number of grievances solved.
- Level of satisfaction with grievance resolutions
- Documentation efficiency
- Dissemination of activities done.
- Efficiency of response to grievance provided (efficiency in time and action taken)

A Grievance Monitoring Report should be developed on a Semi-annually (6 months) basis to keep track of all grievances developed. The report should be developed by the Safeguards Specialist from RUEAP-EDCL.

All grievances received shall be documented in a grievance register. The following table represents the main contents of such form:

Grievance Form

Serial Number: Date: Name: Gender of the aggrieved person: Age of the aggrieved person: Education of the person reporting a grievance: Topic of grievance: Actions to be taken (short term- long term): The referral of grievance: Monitoring for grievance:

7.7.5 Worker's Based GRM

In compliance with national law and WB ESS2, Workers will elect representatives who will form a committee that will act as the Workers Grievance Redress Committee. As mandated by article 102 of the law regulating labor in Rwanda, the employees' representatives amicably settle individual labor disputes between employers and employees. If employees' representatives fail to settle the disputes amicably, the concerned party refers the matter to the labor inspector of the area where the enterprise is located.

In the case of this project, it will be the district where works are being implemented. If the Labor Inspector at the District fails to settle the dispute due to the nature of the case or the conflict of interests, he/she refers the dispute to the Labor Inspector at the national level stating grounds to refer such a dispute. If amicable settlement fails at the national level, the case is referred to the competent court. In any case, the PIU will be informed from the beginning of any workers grievances and provide insight and mediation if possible.

The matter will be referred to the labor inspector only if the PIU fail to do the mediation. By structure, the committee will be composed of 5 members: President who is the Project Manager, Vice president (site Engineer), Secretary (Human Resources Manager/Officer) and 2 elected members form workers. More details on workers' GRM are provided in the LMP of ASCENT.

7.8 Technical Subplans

7.8.1 Avian Protection Plan (APP)

7.8.1.1 Introduction

This Avian Protection Plan (APP) has been prepared as part of the Environmental and Social Impact Assessment (ESIA) for the Construction of 110 kV Double Circuit Transmission Line (Kigoma SS – Mt Kigali SS, 21 km). The purpose of the APP is to identify potential risks to bird species associated with the project and to define appropriate mitigation, monitoring, and management measures to minimize avian impacts during construction and operation phases.

7.8.1.2 Baseline Conditions

The project area is characterized by highly modified landscapes, dominated by agriculture (maize, beans, banana plantations) and degraded wetlands. Field surveys and literature review confirmed the presence of common and widespread bird species, all classified as Least Concern (LC) according to the IUCN Red List.

Common species observed include:

- Pied Crow (*Corvus albus*)
- Cattle Egret (*Bubulcus ibis*)
- Sacred Ibis (*Threskiornis aethiopicus*)
- Grey-headed Sparrow (*Passer griseus*)
- Long-crested Eagle (*Lophaetus occipitalis*)

No endangered, migratory, or protected bird species of conservation concern were recorded within the project corridor.

Bird activity is mainly associated with:

- Feeding in agricultural fields
- Occasional use of wetlands as foraging grounds
- Low-altitude, localized movement between habitats

No major bird migration routes or critical flyways were identified.

7.8.1.3 Potential Impacts on Avifauna

Potential impacts associated with transmission lines include:

Collision Risk

Birds may collide with conductors or shield wires, particularly in:

- Wetland areas
- Low visibility conditions (fog, rain)

Electrocution Risk

Electrocution risk is generally associated with:

- Medium and low voltage lines

- Close spacing between energized components

For this project, the risk is **negligible** due to:

- High-voltage design (110 kV)
- Adequate conductor spacing

Disturbance

Temporary disturbance during construction due to:

- Noise
- Human activity
- Vegetation clearing

Risk Assessment

Based on field observations and habitat characteristics:

- **Overall avian risk level: LOW**
- **Localized medium risk** at:
  - Rugeramigozi wetland
  - Urugondo wetland (precautionary)

No significant cumulative or long-term impacts are anticipated.

7.8.1.4 Mitigation Measures

Design Phase

- Avoidance of critical habitats and protected areas (already achieved)
- Routing through **degraded and agricultural landscapes**
- Maintaining adequate conductor spacing to eliminate electrocution risk

Construction Phase

- Restrict vegetation clearing to designated **Right of Way (25 m)**
- Avoid unnecessary disturbance in wetland areas
- Prohibit hunting or harassment of birds by workers
- Limit construction activities to daytime

Operation Phase

Bird Collision Prevention

- Install **bird diverters (flight markers)** on conductors at:
  - Rugeramigozi wetland crossing (mandatory)
  - Urugondo wetland (if monitoring confirms need)
- Use high-visibility devices such as:
  - Spiral bird flight diverters
  - Reflective markers

The spatial distribution of wetlands and agricultural land does not support the formation of defined bird flight corridors, and observed bird movements are diffuse and localized rather than concentrated along specific pathways.

Vegetation Management

- Maintain low-growing vegetation within RoW
- Avoid creating attractive nesting or roosting hazards near conductors

7.8.1.5 Avian Monitoring Plan

Objectives

- Verify effectiveness of mitigation measures
- Detect any bird collisions or mortality
- Identify need for additional mitigation

Monitoring Activities

Parameter	Method	Location	Frequency	Responsibility
Bird presence and activity	Visual observation	Wetlands and RoW	Quarterly	Environmental Specialist
Bird collisions	Ground surveys under lines	Wetland crossings	Quarterly	Project Operator
Effectiveness of bird diverters	Visual inspection	Installed sections	Bi-annually	Operator
Mortality incidents	Incident reporting	Entire corridor	Continuous	Contractor/Operator

7.8.1.6 Adaptive Management

If monitoring identifies:

- Increased bird activity
- Collision incidents

Then:

- Additional bird diverters will be installed
- Monitoring frequency will be increased
- Further mitigation measures will be introduced as needed

7.8.1.7 Institutional Responsibilities

- **Contractor:** Implement construction-phase measures
- **Supervising Engineer:** Ensure compliance
- **Project Developer (REG/EDCL):** Oversee implementation and reporting
- **Environmental Specialist:** Conduct monitoring and audits

7.8.1.8 Reporting

- Monitoring results will be included in:
  - Monthly (construction phase) reports
  - Quarterly (operation phase) reports
- Any incident will be:
  - Recorded
  - Investigated
  - Addressed with corrective measures

7.8.2 Wetland Management Plan (Provided in Appendix 6)

7.8.3 Biodiversity Management Plan (Provided in Appendix 7)

Chapter VIII: Monitoring Program

This chapter summarizes the environmental and social risk management and monitoring activities proposed in the Environmental and Social Management Plan prepared for this project. It also identifies the roles and responsibilities of stakeholders in the implementation as well as the estimated cost of the activities.

8.1 Environmental and Social Risk Management Specialists

The project promoter is responsible for environmental and social risk management at the construction site. He must ensure that the Contractor implements the Environmental and social Management Plan, and that the Contractor prepares and rigorously implements the plans incidental thereto:

- Drainage and erosion control plan;
- Disturbed areas rehabilitation plan;
- Waste management plan;
- Emergency plan in case of spillage of contaminants;
- Fuel and other hazardous materials management plan.

That E&S risk management will be undertaken on basis of:

- Content of reports drafted in the context of this mandate, especially in regards with guidelines for design, above-mentioned preventive and mitigation measures, as well as environmental management plans.
- Any additional environmental study that would be required for development of specific projects.
- Conditions contained in the documents of environmental authorization issued by the state.
- Environment protection clauses that will have to be integrated in the contract documents.

A site environmental and social officer who will enforce the implementation of various prevention and mitigation measures will have to be appointed by the Contractor. That officer will have to be involved in the complete period of construction. His responsibilities and mandate will have to be subject to a clear description in the contract documents exchanged between the national environment protection agencies and the project Promoter.

An alert structure in case of accidental spillage will have to be designed by the Contractor and submitted for approval to the PIU E&S and national environment protection agencies and emergency materials (emergency tool kit) will have to be available on site.

The environmental and social risk management officer will be the main stakeholder in charge of control and implementation of environmental requirements applicable to the project. Therefore, he or she will:

- Attend coordination meetings with the Project promoter and the Contractor to assess the environmental compliance of its activities, and, where relevant, define corrective measures.

- Hold sessions for awareness raising and training for workers employed at the construction site. Those sessions will present the main sensitive environmental component, environmental protection measures applicable to works, and the alert structure in case of accidental spillage of pollutants.
- Enforce the implementation of all mitigation measures and other provisions relating to environment protection, raise any derogation and enforce implementation of required corrective measures.
- Guide decision making about environment during the work progress, even during unforeseen or emergency situations.

The environmental and social risk management should extend during construction phase to the quality control by the end of works.

Table 28 summarizes the activities requiring increased protection, the necessary parameters, measure frequencies and responsibilities.

Table 28: Environmental and Social Monitoring Plan

Component	Project Stage	Impact to be Monitored	Indicator / Parameter	Standard / Reference	Location	Frequency	Implementation	Supervision	Estimated Cost (USD)
Water Quality	Construction	Pollution from camps, runoff, spills	pH, Turbidity, TSS, BOD, COD, DO, Oil & Grease, Nitrates, Coliforms	REMA Standards; WB EHSG	Wetlands, nearby streams, campsites	Monthly	Contractor	E&S Specialist	9,000
Soil Erosion & Sedimentation	Construction	Soil erosion, sediment runoff	Visual erosion signs, sediment load, turbidity downstream	REMA Guidelines	Slopes, tower sites, wetlands	Before & after rainy season	Contractor	E&S Specialist	3,000
Air Quality / Dust	Construction	Dust emissions from works and traffic	PM10, PM2.5, TSP, dust deposition	WB EHSG; WHO	Access roads, settlements	Monthly	Contractor	E&S Specialist	12,000
Noise Levels	Construction	Noise disturbance to communities	dB(A) levels	REMA; WB EHSG	Equipment yard, schools, settlements	Monthly / upon complaint	Contractor	E&S Specialist	2,000

Component	Project Stage	Impact to be Monitored	Indicator / Parameter	Standard / Reference	Location	Frequency	Implementation	Supervision	Estimated Cost (USD)
Vegetation Loss (Deforestation)	Construction	Tree cutting and vegetation clearing	Number of trees felled, species, area cleared (ha)	ESMP; National Forestry Guidelines	Entire RoW	Continuous / Monthly reporting	Contractor	E&S Specialist	3,000
Reforestation / Restoration	Operation	Compensation planting success	Survival rate (%), number of trees planted	ESMP; Forestry Standards	Reforestation sites	Bi-annually	EDCL	E&S Specialist	5,000
Wetland Integrity	Construction & Operation	Disturbance to wetlands	Wetland area affected, vegetation condition, water flow	REMA Wetland Guidelines	All 6 wetlands	Quarterly	Contractor / EDCL	E&S Specialist	6,000
Avifauna (Bird Collision Risk)	Operation	Bird collisions with lines	Number of carcasses, species affected, location	WB ESS6; GIIP	Wetland crossings	Quarterly	EDCL	E&S Specialist	4,000
Wildlife Disturbance	Construction & Operation	Habitat disturbance and fauna presence	Species presence, sightings, disturbance signs	WB ESS6	RoW and adjacent habitats	Quarterly	Contractor / EDCL	E&S Specialist	4,000

Component	Project Stage	Impact to be Monitored	Indicator / Parameter	Standard / Reference	Location	Frequency	Implementation	Supervision	Estimated Cost (USD)
Waste Management	Construction	Improper waste disposal	Waste segregation, disposal records, site cleanliness	REMA; WB EHSG	Camps, work sites	Weekly	Contractor	E&S Specialist	3,000
Hazardous Materials & Spills	Construction	Fuel/oil leaks and spills	Spill incidents, containment measures	WB EHSG	Storage areas, sites	Continuous / Monthly reporting	Contractor	E&S Specialist	3,000
Traffic & Road Safety	Construction	Increased traffic risks	Number of incidents, speed compliance	WB EHSG	Access roads, communities	Monthly	Contractor	E&S Specialist	4,000
Occupational Health & Safety (OHS)	Construction & Operation	Worker safety risks	LTIFR, PPE usage, incidents, trainings	WB EHSG; National OHS	Work sites	Monthly	Contractor / EDCL	H&S Specialist	8,000
Community Health & Safety	Construction	Exposure to project risks	Incident reports, awareness sessions	WB ESS4	Project-affected communities	Quarterly	Contractor	E&S Specialist	5,000

Component	Project Stage	Impact to be Monitored	Indicator / Parameter	Standard / Reference	Location	Frequency	Implementation	Supervision	Estimated Cost (USD)
GBV / SEA / SH Risks	Construction	Social risks from labor influx	Reported cases, awareness sessions, CoC compliance	WB Good Practice Note	Project area	Quarterly	Contractor	E&S Specialist	7,000
Grievance Redress Mechanism (GRM)	Construction & Operation	Community complaints	Number of grievances, resolution rate (%)	ESMP; WB ESS10	Project area	Monthly	EDCL	E&S Specialist	5,000
Livelihood Restoration (RAP)	Construction & Operation	PAP livelihood recovery	% PAP compensated, livelihood restoration success	RAP; WB ESS5	Affected households	Quarterly	EDCL	E&S Specialist	15,000
Cultural Heritage (Chance Finds)	Construction	Damage to cultural sites	Number of chance finds, response actions	National Law; ESMP	Excavation areas	Continuous	Contractor	E&S Specialist	2,000
Site Rehabilitation	Construction	Land degradation after works	% rehabilitated sites, vegetation recovery	ESMP	Camps, borrow pits	Monthly	Contractor	E&S Specialist	10,000
Total									110,000

8.2 Environmental Monitoring

In the context of the project, monitoring programs that will be developed must highlight the following:

- Expected impacts on the edge or within protected areas and sensitive areas;
- Long-term impact (five years) of the presence of lines on avifauna: This activity may be entrusted with a national NGO committed to bird protection.
- Modification of erosion and sedimentation phenomena in the RoW and access roads.
- Success of rehabilitation of sites disturbed by works. Monitoring after works includes:
    - Inspections.
    - Visual observations.
    - Surveys.
    - Selection of critical environmental parameters and their regular sampling.

8.3 Institutional/Organizational and Responsibilities in ESMP Implementation

This section sets out the institutional and organizational arrangements as well as roles and responsibilities for the implementation of the ESIA/ESMP.

8.3.1 Role of the Project Implementation Unit (PIU)

The PIU shall be responsible for oversight and the implementation of mitigation measures in this ESMP and general compliance of the project with any permits, licenses and Approval Conditions and related regulations and standards on environment. The Unit will be responsible for ensuring that, the project facilities comply with the environmental and social requirements as shall be detailed in the contract documents as well as with other guiding contractual provisions and documentations.

8.3.2 The Role of REG-EDCL

REG/EDCL will be responsible for the implementation of the Project through contractors. Its Environmental Unit headed by an Environmental Specialist has the basic training and experience in environmental and social issues and can effectively coordinate and provide expert advice to contractors on how to effectively implement the required environmental and social standards (ESSs) under the project. REG will be responsible for contract management in order to ensure that the contractors adhere to their contractual obligations and that they are compliant with the environmental and social standards as spelt out in their contracts. However, it is proposed that short-term technical assistance be provided under the project to strengthen the Unit's capacity, covering technical support, equipment and specialized training.

8.3.3 Role of REMA

REMA is specifically mandated by the National Environment law as the principal agency in Rwanda and is charged with the responsibility of monitoring, supervising, and regulating all environmental management matters in the country. One of the key institutional mandates of REMA include among others ensuring the observance of proper ESSs in the planning and execution of all

development projects including those already in existence that have or are likely to have significant impact on the environment. The role of REMA will be monitoring project implementation in accordance with the provisions of the law and the respective regulations. From the discussions, REMA has adequate technical capacity to monitor the project activities through its Department of Environment Monitoring and Compliance in addition to the District Environment Officers in the respective project areas that will be able to report any cases of noncompliance. Overall, REMA is well placed to capture both environmental and social issues either through their mandatory compliance audits or through monitoring reports by the respective District Environment Officers.

8.3.4 District Local Authorities

District and Local Council in project Districts will be vital in implementation of the project in terms of mobilizing political goodwill and sensitizing communities about the project as well as their District Environment Officers who will be taking care of environmental and social aspects of the project at their levels. The DEOs in the respective areas of project implementation will monitor the project to ensure mitigation measures are adequately implemented. The DEOs will also have to review all project environmental and social assessment reports and provide comments during their review to RDB before issuance of Approvals. The DEOs will also ensure that, the project activities are implemented in accordance with RDB conditions of approval. The DEOs will also attend the monthly site meetings for the project and be able to point out issues of concerns.

8.3.5 The Local Leaders

The local leaders in the project areas will have a role on matters of helping contractors access land for the project facilities set ups. They will be key in aspects of labour identification and endorsements. The local leaders will support law enforcement agencies in curbing crime during project implementation.

8.3.6 The Role of the Contractors

Contractors will be responsible for complying with all relevant legislation and adhere to all mitigation measures specified in the ESIA and its ESMP. REG will therefore have to ensure enforcement of mitigation measures which will be enshrined under contractual obligations. The contractors will be obliged to have resources to ensure implementation of environmental and social management obligations in the contract (this ESMP shall be part of the Contract) through hiring Environmental and Social Management Specialists to operationalize the environmental and social requirements in the ESMP and supporting documentation.

8.3.7 Role of Supervising Consultants

The Supervising Consultants should have in their teams at least Environment and Social Management Specialist who will have overall responsibility of ensuring that, project implementation process complies with this ESMP, RDB conditions of approval as well as contract provisions. The Environmental and Social Management Specialists shall work closely with EDCL Environmental and Social Risk Management team in supervising the contractor. In addition, the Supervising Consultants will conduct scheduled site supervisions to monitor state of environmental compliance as documented or executed by the Contractors' Environmentalists. The Supervising

Consultants will have obligation to also oversee compliance and observation of health and safety and labor requirements alongside other cross-cutting issues in the project.

8.4 Institutional Capacity Strengthening

Capacity strengthening of institutions involved in environment management is paramount.

Concerned Districts could be strengthened to develop their capacities in environment management. Capacity development sessions shall be organized for Districts' staff in charge of environmental management, which will make it possible to monitor and assess action taken. Facilities will be given to partners that are involved in monitoring and evaluation of mitigation measures.

The capacity building shall also be given to the contractor's staff in form of induction before starting the project activities especially on health and safety, the grievance redress committees shall also be strengthened by providing sufficient information on how to manage grievance in the community, the capacity building will be part of the monitoring activities during all process of the project activities implementation, the detailed capacity building plan is shown in Table 29.

Table 29: Detailed capacity building plan

Training course	Unskilled labor	Skilled labor	Frontline supervisors	Middle management	Senior manager	Drivers	Safety men
Intro to the OHS	**X**	**x**	**x**	**x**	**x**	**x**	**x**
Emergency response	**X**	**x**	**x**	**x**	**x**	**x**	**x**
Hazards& controls			**X**	*	*		
Foreman responsibilities			*	**x**	**x**		
Managing safely			**x**	*	*		
Managing rule-breaking				*	*	**x**	
Fire prevention	*	*	**x**	**x**	**x**		**X**
First aid	*	*	*	*			
Confined space entry	**X**	**x**	**x**	**x**	**x**		
Back safety/ lifting safety	**X**	**x**	**x**	**x**	*		
PPE	**X**	**x**	**x**	**x**	**x**	**x**	**X**
Fall protection		*	*	*	*		
Small/ power tools		*	*	*	*		
Hand Safety	**X**	**x**	**x**	**x**	**x**	**x**	**X**
Scaffold construction			**x**	**x**	**x**		
Forklift operations	**X**	**x**	**x**	**x**	**x**		

Training course	Unskilled labor	Skilled labor	Frontline supervisors	Middle management	Senior manager	Drivers	Safety men
Hazard recognition	**X**	**x**	**x**	**x**	**x**	**x**	**X**
Excavation safety			**x**	*	*		**X**
Health& hygiene	*	*	**x**	**x**	**x**		**X**
Environmental awareness	**X**	**x**	**x**	**x**	**x**		**X**
Excavation safety	**X**	**x**	**x**	**x**	*		**X**
Risk assessment		**x**	**x**	**x**	**x**		*
Hazard registers				**x**	*		
Lifting operations		**x**	**x**	**x**	*		
Safe use of chemicals	**X**	**x**	**x**	**x**	*	**x**	**X**
Accident prevention	**X**	**x**	**x**	**x**	**x**	**x**	**X**

8.5 Environmental Awareness and Training Plan

Training will be mostly based on environmental laws and regulations in force in the country, but also on the best practices in terms of environmental management including:

- Tree removal.
- Watercourse and swamp protection.
- Hazardous material management.
- Waste management.

Staff in charge with environmental issues in Districts should receive short training in order to strengthen their capacities and help them fulfill their role.

Training on sensitization about awareness of risks associated with construction and operation of the transmission lines will have to be organized, especially during the construction phase of the line.

Those in charge of monitoring and evaluation of mitigation measures will have to receive training in those areas.

Employees of this project should receive specific training for accident prevention and hazards precautions and procedures for the safe storage, handling, transport and use of potentially harmful materials that are relevant to each employee's job task and work area.

Training will also be given on emergency response systems and procedures including the location and proper use of emergency equipment, use of personal protective equipment, procedures for raising the alarm and notifying emergency response teams, and the proper response actions for each foreseeable emergency situation.

Daily safety and environment briefings including inspections of personal protective equipment will be conducted by relevant supervisors or shift bosses.

A safety and environmental induction will be carried out for new employees and for any person arriving on site after a break exceeding two weeks or any contractor arriving on site. The safety induction will cover: the use of personal protective devices, dangerous areas, appropriate conduct, emergency response procedures and waste management.

The following should be part of the Environmental Awareness and Training Plan

Purpose and Scope: All employees will be required to comply with environmental protection procedures and therefore, proper training shall be given to the workers. The training program aims to ensure that project employees:

- Are aware of the environmental issues associated with the project;
- Understand their responsibilities with respect to these issues;
- Are aware of the liability potential if adequate and reasonable (due diligence) measures are not taken to protect the environment.
- Understand requirements for protection of the environment, best management practices and avoidance measures; and
- Are aware of the relevant regulations and guidelines.

Delivery: Classroom training should preferably be given before they are assigned on construction work; this can coincide with health and safety orientation. Short, follow-up sessions will be delivered on ground as required. Environmental awareness messages shall be posted in the field office(s). Indicative environmental awareness principles and topics are shown in Table below.

Table 30: Environmental Awareness Principles and Topics

Topics	Objectives
Erosion and Sediment Control	To educate project personnel on practices that can be implemented to control erosion and maintain good water quality.
Air Quality	That machine operators will be made aware of the potential effect on air quality that their machines can have and how to keep their equipment in good running order
Dangerous goods Transportation, Storage and Handling	To educate and make all personnel aware of the harmful or dangerous substances present on-site. To educate personnel on the best methods and requirements for transporting, off-loading, installing facilities and servicing of equipment. The emphasis will be on spill prevention
Solid Waste Management	To educate and make project personnel aware on the practices permitted to dispose of wood, food and paper, sewage and special wastes

Topics	Objectives
Spill Prevention	To educate project personnel on spill response procedures to protect the environment or minimize impacts from spills of hazardous materials and release of deleterious substance, including sedimentation. All personnel will be made aware of the Spill Prevention and Emergency Response plan and the location of spill prevention and cleanup equipment.
Safety Equipment	For their own sake, the construction workers should be instructed to observe safety rules. Good protective clothing (working garments), helmets, boots, gloves, etc. should be provided. Regulation must be enforced to ensure that they are worn at all times when working
Reporting Structure	This part of the course will inform project personnel of who to call if an environmental concern arises. Generally, an employee will inform the Government Agencies as appropriate.

8.5.1 Responsibility

The Construction team including site manager, safety officer and Environmental Inspector or their designate is responsible to deliver the training to all construction personnel.

8.6 General Emergency Response Measures

The operation of the proposed development will involve workers who may become ill or have accidents. In addition, disasters such as, floods and fires are real possibilities. The following measures should be implemented:

- Make prior arrangements with health care facilities such as a Health Centre in proximity to the site to deal with any medical emergencies; During construction, first aid equipment should be available at the site. A number of the permanent personnel on the site should have the skills necessary to use the equipment.
- Design an Emergency Evacuation Plan (EEP) in the event of a fire. Fire evacuation plan should be developed; this should include measures to follow exit routes. Maps of exit routes should also be made available to all workers and visitors.
- The Site Management should coordinate with mutual aid organizations/agencies such as with the local fire brigade to deal with emergencies;
- Provide fire extinguishers at site offices, stores and workers' camps.

8.6.1 Fire Preparedness

The plan of emergency in case of fire or accident should be elaborated for the implementation in the case of fire outbreaks during both the construction and operations phases. This plan will consist of two parts:

- Availability of a workforce and the materials.
- An Alarm system and organization of the first aid.

The fire-fighting equipment should be available at all workshops and warehouses and should be kept permanently in good working state. The skills in the use of these fire- fighting equipment should be one of the key points during the training of the construction and operation staff. The personnel technician in charge of the maintenance and the site management should regularly check this equipment and ensure that they are always ready to be used. A contract should be signed between the construction company and the nearest dispensary or hospital for taking care of injured staff. The insurance should be contracted for all the personnel during the construction phase and for those who will be employed during the operation phase.

8.7 Costs Related to ESMP Implementation

8.7.1 Costs Related to Construction

Costs for environmental management plan are summarized in Table 24. Overall, all the measures to be implemented are costed at 75,100 USD, including administration costs at 2% and contingency costs at 10%.

Chapter IX: Conclusion and Recommendations

9.1 Conclusion

Access to electricity is one of the primary constraints to the Rwanda economy; providing such access unlocks economic opportunity. In the context of this project, such opportunity would most likely be taken up by the service and processing industries, which can then rely on stable electricity to build a business on. The positive impacts from this project will result in local economic growth along the transport and trading routes in the concerned districts. The rural landscape into which the extension of the national electricity supply is proposed, hosts an agro-ecosystem that is largely rural in which continued wetland encroachment and deforestation pose as threats to ecosystem resilience.

Much of the natural vegetation in the Project Site has been transformed, with inaccessible riparian areas and pockets of remnant forest remaining in places. The proposed route crosses numerous water streams areas. Only common and widespread fauna (mainly birds, small mammals, reptiles and amphibians) were observed on the site, since the land is primarily used for agriculture. The rural homestead is typically supported by crops grown for own use, cash crops and small-scale stock farming. Trading centres provide access to basic commodities, like food stuff, fuel, materials, as well as provide for a growing service sector. Maize farming, cattle farming, milk production and pig farming, are all strong components of the rural agro-economy. These activities can become more productive and strengthen the local economy, especially if agro-processing facilities become more established. Care should be taken when determining specific tower locations, during the final design stage, to avoid impacts to specific environmental and social features. There is overwhelming support for the project by all stakeholders, yet certain negative social impacts and cautions have also been raised, as well as ways to deal with them as detailed in the Environmental and Social Management Plan (ESMP).

It is necessary to make sure mitigation measures are implemented continuously through on-site monitoring, reporting and intervention. Various social issues raised during stakeholder engagement, can be better managed, as detailed in ESMP. The specific negative social impacts related to vulnerable groups, like women and children, require specific attention and exceptional implementation and management.

The next stage of the work lies in the final design of the route and tower positions, being fully cognizant of and planning around impacts to the sensitive environmental and social features identified. Details are provided in the form of a design guideline, to highlight and respond to specific sensitivities along the current route design. The proposed extension of the national grid is a tried and tested method and currently proves the most practical and cost-effective manner to deliver electricity into the rural areas of Rwanda. With growing interest and more cost-effective technology being available, the use of solar power, in cases where it is applicable, will also continue to grow. Through effective implementation of the mitigation measures, stipulated in the resulting Environmental and Social Management Plan (ESMP), the probable risks of this project can be managed and mitigated. It is critical to realize that the project must be implemented within the suggested ESMP guidelines, to avoid negative impacts related to gender inequality, gender-based violence, the abuse of children and exclusion of vulnerable groups, as well as planning around old trees and other significant environmental and social sites features of primary importance in the final

design stage is to focus on site specific placement and in cases of route deviation from the road reserve, holding discussions and negotiations with affected landowners. Such work is facilitated through the implementation of the Resettlement Action Plan (RAP) process for the proposed project. The impact classification in this report informs on the magnitude of the impacts that can happen and where more intervention is needed. Impacts rated as major or average should serve as the basis for priority intervention.

9.2 Recommendations

Based on the nature of the project activities, biophysical conditions of the project area and the potential negative impacts, it is imperative that the following be given serious consideration and attention in order to protect the environment and communities:

- Environmental monitoring programs for this project should be implemented to address all activities that have been identified to have potentially significant impacts on the environment, during construction, operation and decommissioning phases.
- Speedy and appropriate actions must be taken on any issues arising through the monitoring results.
- Occupational health and safety performance should be evaluated against national and/or international standards.
- The developer should try to reduce the number of accidents among project workers (whether directly employed or subcontracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities.
- The working environment should be monitored for occupational hazards relevant to this project.
- The developer of this project is recommended to implement the environmental and social management plan proposed in this report, that will ensure environmental and social compliance of the operations and also to maintain high quality standards.
- REG/EDCL is recommended to take in consideration issues and concerns raised during public consultation especially issues related to compensation and job opportunities.
- REG/EDCL to consider the expropriation law in public interest by complying with the land acquisition and compensation process.
- REG/EDCL needs to implement the prepared Resettlement Action Plan (RAP) for the sub-project by assisting the Project Affected Persons in grievances.

References

1. 7 Year Government Program: National Strategy for Transformation (NST1) 2017 – 2024; Final, September 2017, Republic of Rwanda, Kigali.
2. National Environment and Climate Change Policy, Final, 2019, Republic of Rwanda, Ministry of Environment. Kigali
3. Rural Electrification Strategy, June 2016, Republic of Rwanda, Ministry of Infrastructure. Kigali.
4. Rwanda Energy Group Strategic Plan 2019 – 2024, Final, Kigali.
5. Rwanda Energy Sector Review and Action Plan, 2013, African Development Bank.
6. Rwanda State of Environment and Outlook Report 2015, Republic of Rwanda, Rwanda Environment Management Authority, Kigali
7. Rwanda State of Environment and Outlook Report 2017, Republic of Rwanda, Rwanda Environment Management Authority, Kigali
8. BART, F. 1993. Montagnes d'Afrique; Terres paysannes. Le cas du Rwanda. CEGET-CNRS, PUB (Espaces tropicaux n° 7). 588 p.
9. BESSE, F., 1989.- Pour une flore usuelle du Burundi : Données phénologiques et pratiques. Projet Reboisement Banque mondiale-fonds d'Aide et de Coopération, 79 pp.
10. BIRDLIFE INTERNATIONAL, 2008 BirdLife's online World Bird Database: the site for bird conservation. Version 2.1. Cambridge, UK: BirdLife International. http://www.birdlife.org/Available at: http://www.birdlife.org (accessed 15/4/2009).
11. BIZIMANA, Ignace, 1990. Les sols des vallées du Rwanda : leurs propriétés morphologiques et physico- chimiques.
12. BUNEP, 1986. Étude pour le développement de la pêche et de l'empoissonnement des lacs du Nord et de l'Est du Rwanda, Rapport définitif, Étude bibliographique, Phase 1. Kigali.
13. CALIFORNIA ENERGY COMMISSION, 2002. A Roadmap for PIER Research on Avian Collisions with Power Lines in California. Commission Staff Report. Public Interest Energy Research.
14. Center for Geographic Information System (CGIS), 2006. Les couches de base pour les limites administrative, les routes, les cours d'eaux, les lacs et le relief etc.
15. CITES, 1995. Conservation on International Trade in Endangered Species of Wild fauna and Flora. COMITÉ NATIONAL AVIFAUNE, novembre 2006. Oiseaux et lignes électriques in Bulletin du Comité national avifaune. n°3 - novembre 2006.
16. CONSEIL DE L'EUROPE, 2003. Projet de recommandation sur l'atténuation des nuisances des installations aériennes de transport d'électricité (lignes électriques) pour les oiseaux. Convention relative à la conservation de la vie sauvage et du milieu naturel de l'Europe. Document établi par Birdlife International et revu par la Direction de la Culture et du Patrimoine culturel et naturel. 5 p.
17. CONSEIL DE L'EUROPE, n.d. Lignes à haute tension : comment protéger les oiseaux. Sauvegarde de la nature, no 140.
18. DE VOS, Luc, 1986. Étude pour le développement de la pêche et de l'empoissonnement des Lacs du Nord et de l'Est du Rwanda. « Contribution à la connaissance de l'ichthyofaune du Rwanda : Chef de détermination des espèces des lacs Bulera et Ruhondo et des

dépressions du Ruhango et de l'Akagera ». Rapport pour I.N.R.S., BUNEP et MINAGRI. 1986.
19. Experco des Grands Lacs, 2003. Etudes relatives à la protection intégrée et conservation des ressources naturelles des zones humides critiques du Rwanda. Évaluation de la diversité biologique. Kigali. 150 pp.
20. Fischer, E. & Hinkel, H., 1992. La nature du Rwanda. Ministère de l'intérieur et des sports, Rhénanie Palatinat, R.F.A. Université J. Gutenberg, Mayence et Institut de recherche Scientifique et technologique (IRST), Butare.
21. FISHPOOL, L.D.C. & EVANS, M.I., 2001. Important Bird Areas in Africa and Associated Islands: Priorities Sites for Conservation. Newbury and Cambridge, UK : Pisces Publications and Birdlife International (BirdLife Conservation Series No. 11, 703-711 pp.
22. GAUGRIS, Y., 1983. - Liste des oiseaux du Parc national de la Ruvubu. Rapp. inéd.
23. GILON, Y., 1983. – The fire problem in tropical savannas. In: F. Bourlière. The Tropical savannas. Amsterdam, Elsevier, Ecosystems of the world: 617-641.
24. GSCHWENG, M. et al. ,2008.- All across Africa: highly individual migration routes of Eleonora's falcon Proc. R. Soc. B doi:10.1098/rspb.2008.0575 Published online.
25. HECK, Nikki, September 2005. Bird Collisions with Electric Power Transmission Lines: Frequently Asked Questions (FAQs). ALTALINK. 5 p.
26. IUCN, 1997. The 1997 IUCN Red List of Threatened Species. IUCN, Gland. IUCN, 2008. IUCN Red List of Threatened Species. <www.iucnredlist.org>.
27. LEBEL, Jean Paul, 2005. La liste des espèces d'oiseaux inventoriés dans le marais de la Nyabarongo. MINAGRI, 2005. Plan stratégique de transformation agricole au Rwanda. Kigali, 210 p.
28. MININFRA, 2006. Synthèse des données des stations météorologiques du Rwanda, Kigali, 38 pp.
29. MURERÉREHE, Sabin, juin 2000. Etat des ressources forestières au Rwanda. EC/FAO ACP Collecte de données - Rapport Technique AFDCA/TR/14. 59 p.
30. NSENGIYUMVA, R., 2006. - Etat des lieux du bassin de l'Akagera. Rapport de mission, FAO, 35 pp.
31. PRATT, DJ. et M.D. GWYNNE, éds 1977. - Range-land Management and Ecology in East Africa (Gestion des terres de parcours et écologie en Afrique de l'Est). Hodder et Stoughton, London, 310 pp.
32. PRIOUL. G, SIRVIREN, P. et al., 1981. Atlas du Rwanda. Imp. Vanden Brugge-44360, La Paquelais Paris. SCHOUTEDEN, H., 1966. La faune ornithologique du Rwanda.1966.
33. SOGREAH, 1991. Étude du plan directeur d'aménagement et de mise en valeur des vallées de la Nyabarongo et de l'Akanyaru, Étude d'environnement, Rapport général. Avenant n° 2.
34. VAN DE WEGHE, J.P et KABAYANDA, A., 1992. Le Parc National de la Ruvubu et sa région limitrophe : Étude d'identification. Étude n° ET/44/2/92-SEP Commission des Communautés Européennes, 195 pp.
35. Vital Signs Rwanda. (2018). Vital Signs Project Data. Kigali: Vital Signs Rwanda.
36. UNEP. (2011). Rwanda: From Post-Conflict to Environmentally Sustainable Development. Nairobi.

37. NISR and MINALOC. (2006). Revised Administrative Boundaries of Rwanda 2006. Kigali: National Institute of Statistics of Rwanda.
38. Nyandwi, E., Veldkamp, T., & Amer, S. (2016). Regional Climate Sensitivity of Wetland Environments in Rwanda: the Need for a Location-Specific Approach. Regional Environmental Change, 16(6), 1635–1647. https://doi.org/10.1007/s10113-015-0905-z
39. Rwanda Atlas - Environment, Agriculture and Livelihood Options, (2018) Vital Signs Project.
40. VERSCHUREN, J., 1958. – Le statut actuel des grands ongulés du Congo belge et du Ruanda-Urundi, principalement dans les parcs nationaux. Mammalia, 22, 3 : 406-417.
41. White, F. 1983. The vegetation of Africa, a description memoir to accompany the UNESCO/AETFA/UNSO vegetation Map of Africa (3, plate, North western Africa, North-eastern Africa, and Southern Africa 1:5,000,000) UNESCO, Paris.
42. BirdLife International (2024). *Important Bird Areas factsheets: Akanyaru wetlands; Nyungwe National Park.* BirdLife DataZone, https://datazone.birdlife.org.
43. Key Biodiversity Areas Partnership (2012). *Akanyaru wetlands (KBA 6777), Rwanda.* https://www.keybiodiversityareas.org/site/factsheet/6777

Appendices

Appendix 1: Stakeholder Engagement

STAKEHOLDER ENGAGEMENT

Stakeholder engagement is a vital component of the ESIA process. The consultation and engagement process focuses on providing information on the proposed project in a manner that can be understood and interpreted by the relevant audience. It provides an opportunity to seek comment on key issues and concerns, sourcing accurate information, identifying potential impacts and offering the opportunity for alternatives or objections to be raised by the potentially affected parties, non-governmental organizations, members of the public and other stakeholders. Consultation has also been found to develop a sense of stakeholder ownership of the project and the realization that their concerns are taken seriously, and that the issues they raise, if relevant, are addressed in the ESIA.

Consultations were conducted at National, District and Local levels. Consultations were held along the entire lengths of the power lines corridors during the period of 27 July to 28 August 2025 at Nyamabuye Sector, Gahogo cell, with households and individuals whose land, crops, or structures will be affected by the construction of the 110 kV transmission line project. The meeting was facilitated by the representatives from EDCL, district official representative, local leaders, and the RAP preparation team. A total of 108 participants attended, including men, women, and vulnerable groups, ensuring that all categories of PAPs are provided an opportunity to express their views and concerns regarding the project (attendance lists in Appendices 2 and 3).

This consultation has ensured that the voices of PAPs are fully integrated into project design. This participatory process strengthens the legitimacy, transparency, and acceptability of the resettlement process, thereby ensuring that the 110 kV transmission line project not only complies with national and World Bank requirements but also enjoys strong community ownership and support

Stakeholders

Key stakeholders have been identified and initial discussions held with decision making bodies, key stakeholders, sector institutions and specialist experts were made on the very concepts and nature of the proposed project, giving emphasis on levels of public participation, role of key stakeholders and joint contributions of these actors to the success of the project. In addition, the scope of the proposed project and possible means of maximizing local communities' social, economic and environmental benefits from the project implementation were underlined. Key stakeholders identified for consultation during preparation and implementation of RAP include but not limited to the following:

At national level:

- Ministry of Environment (MoE);
- Ministry of Infrastructure (MININFRA);
- Rwanda Environment Management Authority (REMA);
- Rwanda Standards Board (RSB);
- Rwanda Development Board (RDB);
- National Land Authority (NLA)
- Rwanda Utilities Regulatory Authority (RURA)
- Rwanda Forestry Authority (RFA) and Rwanda Water Resources Board (RWB)

At local level:

- Local Government Officials (Districts and Sectors);
- REG District Branch managers and
- Project Affected People (PAPs).

At Community level

Consultation with few members among the PAPs

Consultation and dialogue with PAPs is important for successful resettlement and/or compensation of the affected. The meeting was conducted by EDCL E&S Risk Management team from 27 July to 28 August 2025.

Appendix 2: List of 35 Consulted People in Muhanga District

S/N	*PROPERTY OWNER*	*SECTOR*	*CELL*	*VILLAGE*
1	HAKIZAYEZU SAMUEL	NYAMABUYE	GAHOGO	GIHUMA
2	HAKIZIMANA JEAN BOSCO	NYAMABUYE	GAHOGO	GIHUMA
3	Nsengiyumva Edouard and Ugirimbabazi Benilde	NYAMABUYE	GAHOGO	GIHUMA
4	HAKIZIMANA JEAN BOSCO	NYAMABUYE	GAHOGO	GIHUMA
5	NYIRANSABIMANA APPOLINARIE	NYAMABUYE	GAHOGO	GIHUMA
6	KANEZA APHRODIS	NYAMABUYE	GAHOGO	GIHUMA
7	Berwa Aphrodis	NYAMABUYE	GAHOGO	GIHUMA
8	Berwa Antoine	NYAMABUYE	GAHOGO	GIHUMA
9	GATONI Jean	NYAMABUYE	GAHOGO	GIHUMA
10	Rachel Nyirabutoragurwa	NYAMABUYE	GAHOGO	GIHUMA
11	NAYITURIKI SERAPHINE	NYAMABUYE	GAHOGO	GIHUMA
12	TWIGIRIMANA EDUORD	NYAMABUYE	GAHOGO	GIHUMA
13	MBONIGABA THEOGEN AND JUDITHE NIKUZE	NYAMABUYE	GAHOGO	GIHUMA
14	BIHOYIKI JEAN CAMARADE	NYAMABUYE	GAHOGO	GIHUMA
15	GATOKI JEAN CLAUDE	NYAMABUYE	GAHOGO	GIHUMA
16	NKURIKIYINKA FRANCOIS	NYAMABUYE	GAHOGO	GIHUMA
17	TWAGIRIMANA EDOUARD	NYAMABUYE	GAHOGO	GIHUMA
18	NCUNGUYINKA XAVIER	NYAMABUYE	GAHOGO	GIHUMA
19	NGARUKIYIMANA DAMIEN	NYAMABUYE	GAHOGO	GIHUMA
20	NYANDWI MATHIAS	NYAMABUYE	GAHOGO	GIHUMA
21	HABUMUGISHA INNOCENT	NYAMABUYE	GAHOGO	GIHUMA
22	TWAGIRIMANA JEAN CLAUDE AND NYINAWUMUNTU CLEMENTINE	NYAMABUYE	GAHOGO	GIHUMA
23	UWITARATANGA ROMARIKO	NYAMABUYE	GAHOGO	GIHUMA
24	GABRIEL NTIVUGURUZWA	NYAMABUYE	GAHOGO	GIHUMA
25	KAKUZE MEDIDRICE	NYAMABUYE	GAHOGO	GIHUMA
26	KAKUZE ODETH	NYAMABUYE	GAHOGO	GIHUMA
27	Akimana Fidel	NYAMABUYE	GAHOGO	GIHUMA
28	NTEZIRYAYO VICTOR AND UWIJURU ANGE	NYAMABUYE	GAHOGO	GIHUMA
29	DUKUZEMARIYA VALENS	NYAMABUYE	GAHOGO	GIHUMA
30	NTIBITURWA EMMANUEL	NYAMABUYE	GAHOGO	GIHUMA
31	MBONIGABA THEOGENE AND NIKUZE JUDITH	NYAMABUYE	GAHOGO	GIHUMA
32	NYINAWUMUNTU FALIDA & JUSTIN	NYAMABUYE	GAHOGO	GIHUMA
33	BYAMARIZA Charlotte	NYAMABUYE	GAHOGO	GIHUMA
34	NYIRABAZUNGU Rose	NYAMABUYE	GAHOGO	GIHUMA

35	HABIMANA JOSEPH	NYAMABUYE	GAHOGO	GIHUMA

Appendix 3: List of 73 Consulted People in Ruhango District

No.	Names	Function	Institution	Tel
1	SHIRIMPAKA Felicien	Farmer	Local Resident	783747656
2	UZABAKIRIHO J.M. V	Farmer	Local Resident	780371297
3	TWAGIRAYEZU Elezaus	Farmer	Local Resident	789698850
4	NIYONSABA Isaie	Farmer	Local Resident	783327980
5	RUGIRANYIRAZO Sylvain	Farmer	Local Resident	784475704
6	HABANABAKIZE Thomas	Farmer	Local Resident	784765637
7	TUYISHIMIRE Jeanvier	Farmer	Local Resident	734643546
8	MUGABO Alphonse	Farmer	Local Resident	785024141
9	NIRAGIRE Francine	Farmer	Local Resident	784256735
10	RUTAYISIRE	Farmer	Local Resident	786765711
11	MUHAWENIMANA Joselyne	Farmer	Local Resident	780190083
12	NDAYISENGA Jean Baptiste	Farmer	Local Resident	784627835
13	NSEKANABO Vincent	Farmer	Local Resident	788831736
14	RUBONEKA Isaac	Farmer	Local Resident	783138295
15	Mbarubukeye Aphrodise	Farmer	Local Resident	782359590
16	MUSABYEMARIYA Penelope	Farmer	Local Resident	783278620
17	NDAGIJIMANA Pierre	Farmer	Local Resident	786403633
18	HAKIZAMUNGU Saidi	Farmer	Local Resident	785051833
19	GAKWERERE Tharcisse	Farmer	Local Resident	785181578
20	NZAYISENGA Emmanuel	Farmer	Local Resident	789914547

21	BIMENYIMANA Emmanuel	Farmer	Local Resident	786547540
22	NIYIMBONEZA Aloys	Farmer	Local Resident	784185550
23	NTAWUVUGURUZIMANA Jean D'Amour	Farmer	Local Resident	782735640
24	HATEGEKIMANA Eliazar	Farmer	Local Resident	789453816
25	HABIMANA Amiel	Farmer	Local Resident	787225985
26	SIKUBWABO Joseph	Farmer	Local Resident	785337099
27	NAYINO Suzana	Farmer	Local Resident	784989467
28	NSABIYEBOSE Djuma	Farmer	Local Resident	787331511
29	RUTAYOMBA Habib	Farmer	Local Resident	780284499
30	MBARIYINEZA Theogene	Farmer	Local Resident	732515355
31	KAREKEZI Justin	Farmer	Local Resident	789468866
32	KAREGEYA Leopord	Farmer	Local Resident	786859595
33	BIMENYIMANA Emmanuel	Farmer	Local Resident	783288091
34	MANIRAHO Faustin	Farmer	Local Resident	784170947
35	NKOMEJE Landouard	Farmer	Local Resident	784630787
36	NGABONZIZA Francois	Farmer	Local Resident	783029506
37	HABIMANA Vedaste	Farmer	Local Resident	782220435
38	BIHIBINDI Michel	Farmer	Local Resident	782220435
39	NDIHOKUBWAYO Jean Damascene	Farmer	Local Resident	784343996
40	MUHIRE Jean Claude	Farmer	Local Resident	789492450
41	HABUMUREMYI Jean Damascene	Farmer	Local Resident	780337294

42	RUKEMAMPUNZI Vital	Farmer	Local Resident	789182819
43	NGAYABAMWANGA Xavier	Farmer	Local Resident	789747406
44	NSHUMBUSHO Frank	Farmer	Local Resident	786187969
45	MUKANGARUYE Angelique	Farmer	Local Resident	782927426
46	BAZITABOSE Emmanuel	Farmer	Local Resident	789182819
47	UZAMUKUNDA Pascasie	Farmer	Local Resident	789893437
48	BIZIMUNGU Naphtar	Farmer	Local Resident	783625096
49	MUHIRWA Jean Damascene	Farmer	Local Resident	783320098
50	MBARUBUCYEYE Arstide	Farmer	Local Resident	787883065
51	NYIRANEZA Eli marine	Farmer	Local Resident	783580091
52	TURINABO Pierre Celestin	Farmer	Local Resident	788405538
53	SHIRIMPAKA Fulgence	Farmer	Local Resident	788432770
54	UWINEZA Beatha	Farmer	Local Resident	788530737
55	MUKAMANA Jacqueline	Farmer	Local Resident	782770224
56	NSABIMANA Cyprien	Farmer	Local Resident	781926547
57	BABUZE Frederick	Farmer	Local Resident	783268774
58	BIKORIMANA Celestin	Farmer	Local Resident	788656033
59	HATEGEKIMANA Jean de Dieu	Farmer	Local Resident	725364033
60	MUNYANKINDI Jean Claude	Farmer	Local Resident	724518949
61	MUKANDAMUTSA Lucie	Farmer	Local Resident	785390333
62	TWIZEYEMUNGU Gervais	Farmer	Local Resident	726659188

63	BANZIMWABO Ildephonse	Farmer	Local Resident	
64	MUNYEMANA Evariste	Farmer	Local Resident	
65	SEBAHINZI Anastase	Farmer	Local Resident	
66	IRADUKUNDA Candide	Farmer	Local Resident	
67	NSABIMANA Damascene	Farmer	Local Resident	
68	Hererimana Daniel	Farmer	Local Resident	787587455
69	Karera Augustin	Farmer	Local Resident	788662858
70	Uwubumwe Innocent	Farmer	Local Resident	785800241
71	Bazatsinda Thacien	Farmer	Local Resident	
72	Ruvubi Thacien	Farmer	Local Resident	788758885
73	Nyirandorimana Alphonsine	Farmer	Local Resident	

EDCL

ABITABIRIYE INAMA NYUNGURANA BITEKEREZO KU MUSHINGA WO KUBAKA UMUYOBORO MUGARI W'AMASHANYARAZI WA 220kV KIGOMA-RWABUSORO (220kV Double Circuit Kigoma-Rwabusoro Transmission Line) UTERWA INKUNGA NA EXIM BANK

AKARERE... RWANGO.....

UMURENGE... RWANGO.....

ITARIKI: .....22/08/2023.....

NO	AMAZINA	UMURIMO AKORA	IGITSINA (F/M)	TEL	UMUKONO
1	KOMEZA Ofee	Substation operator	M	0788566452	
2	MUTUYIMFURA Emmanuel	Internship	M	0781486721	
3	DUSHIMIMANA MARTIN	Entreprenur in substation	M	0788245541	
4					
5					
6					

Consulted people at Kigoma substation



Public consultation Ruhango District



Consultation in Muhanga District



Consultation at Kigoma substation with the neighboring community

Summary of public consultations and the opinions expressed

Appendix 4: Summary of Key Environmental and Social Issues Raised During Consultations in Different Districts of the Project

Environmental & Social Components	Major Issues and Concerns Expressed
Project Awareness and Perception	Most consulted communities and some local authorities were initially not aware of the project. However, once informed, they expressed strong support, recognizing its importance for improving electricity reliability, enabling economic activities, and reducing isolation. Communities emphasized the need for continuous information sharing and early engagement throughout project implementation.
Land Acquisition, Compensation and Livelihoods	Key concerns relate to land acquisition for tower locations and impacts on crops and trees within the RoW. Communities highlighted risks of land disputes due to customary land practices and land fragmentation. There were strong expectations for fair, transparent, and timely compensation at full replacement cost, including independent valuation to avoid disputes. Concerns were also raised about loss of productive land, reduced land value due to fragmentation, and the need to consider entire household landholding where residual land becomes economically non-viable.
Community Health and Safety	Concerns were raised about risks associated with construction activities, including accidents, falling objects, and exposure to open excavations. Increased traffic from construction vehicles was identified as a risk, especially for children and vulnerable road users. Communities also expressed concerns about potential electrocution risks during operation and the need for awareness campaigns and safety signage.
Labor Influx, GBV/SEA/SH Risks	The influx of external workers may lead to social tensions, increased pressure on local resources, and heightened risks of Gender-Based Violence (GBV), Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH). Communities emphasized the importance of enforcing workers' Codes of Conduct, prioritizing local labor, and implementing awareness and prevention programs targeting both workers and host communities.
Employment and Local Economic Opportunities	Local authorities and communities expect the project to create employment opportunities, particularly for local youth, and contribute to poverty reduction. There is a strong preference for prioritizing local labor recruitment and ensuring fair and transparent hiring processes to enhance local economic benefits.

Environmental & Social Components	Major Issues and Concerns Expressed
Land and Soil Protection	Concerns were raised regarding increased soil erosion, particularly in steep and fragile areas, as well as potential damage to existing erosion control measures such as terraces and drainage systems. Improper land management during construction could exacerbate land degradation and reduce agricultural productivity.
Wetland and Water Resources Protection	Communities highlighted risks of sedimentation of downstream wetlands and water bodies due to soil erosion. Although wetlands in the project area are already degraded and used for agriculture, concerns remain about further disturbance, destruction of water channels, and impacts on water availability and quality.
Access Constraints and Safety in Steep Areas	In steep and hard-to-access zones, concerns were raised about landslides, falling rocks, and risks to downstream communities. It was recommended to limit the use of heavy machinery in such areas, adopt appropriate engineering solutions, and establish warning systems where necessary.
Institutional Coordination and Stakeholder Involvement	Local authorities indicated limited prior involvement in the project and requested stronger engagement in planning, implementation, and monitoring. They emphasized the importance of involving local leaders in grievance management, compensation processes, and environmental monitoring.
Environmental Awareness and Capacity Building	Stakeholders viewed the project as an opportunity to strengthen environmental awareness among communities. They recommended integrating environmental education programs, particularly on soil conservation, sustainable land use, and infrastructure safety, leveraging existing local environmental officers at district and sector levels.

Consulted authorities showed their satisfaction with the project for environmental education opportunities for all the environment components. The project would be a major asset for educating the population on environmental protection programs given that at each district and sector, there is one person in charge of environment.

Appendix 5: Vegetation Types Crossed by the TL (Estimated RoW)

District	Vegetation Type	Expected (Ha)	Percentage of District RoW	Total (Ha)
Ruhango	Mixed Crops (beans, maize, sorghum)	12.635	37.50%	33.688
	Banana plantation	2.448	7.26%	33.688
	Forest	7.084	21.02%	33.688
	Grassland	2.880	8.56%	33.688
	Tea and coffee plantation	8.641	25.65%	33.688
Ruhango Subtotal		**33.688**	**100.00%**	**33.688**
Muhanga	Banana	1.527	8.68%	17.592
	Forest	6.205	35.30%	17.592
	Coffee	1.988	11.31%	17.592
	Others	7.872	44.71%	17.592
Muhanga Subtotal		**17.592**	**100.00%**	**17.592**
Grand Total		**51.280**		**51.280**

Appendix 6: Wetland Management Plan (WMP)

Project: Construction of Double Circuit 110 kV Kigoma–Muhanga Substation Transmission Line (Kigoma SS – Mt Kigali SS, 21 km, Cut-in/Cut-out)

Abbreviations

Abbreviation	Meaning
E&S	Environmental and Social
EDCL	Energy Development Corporation Limited
EMF	Electromagnetic Fields
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESS6	World Bank Environmental and Social Standard 6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources)
GRM	Grievance Redress Mechanism
HSE	Health, Safety and Environment
IUCN	International Union for Conservation of Nature
LC	Least Concern (IUCN Red List category)
PIU	Project Implementation Unit
RAP	Resettlement Action Plan
REG	Rwanda Energy Group
RoW	Right-of-Way
SS	Substation
WMP	Wetland Management Plan

1. Introduction

This Wetland Management Plan (WMP) has been prepared as part of the Environmental and Social Impact Assessment (ESIA) to ensure the sustainable management of wetlands traversed by the proposed transmission line project.

Although all wetlands within the project corridor are already degraded by intensive agricultural use and brick-making activities, they remain environmentally sensitive systems that require mitigation and management in line with national regulations and international standards, particularly the World Bank Environmental and Social Standard on Biodiversity Conservation (ESS6).

2. Objectives of the WMP

The objectives of this plan are to:

- Avoid and minimize impacts on wetlands during project implementation;
- Maintain the hydrological and ecological functions of wetlands;
- Prevent further degradation and promote restoration where feasible;
- Ensure compliance with national environmental laws and international best practice; and
- Provide monitoring and institutional mechanisms for wetland protection.

3. Methodology and Study Approach

3.1 Approach Adopted

The wetland assessment for the proposed transmission line combined field-based investigations, spatial analysis and literature review to provide a robust characterization of wetland conditions along the project corridor.

- **Field surveys:** Detailed field visits were conducted along the entire 21 km transmission line corridor, including all identified wetland crossing points. The assessment involved systematic transect walks across the wetlands and their immediate surroundings to observe land use patterns, vegetation cover, hydrological conditions and signs of ecological disturbance. Particular attention was given to confirming the absence of intact natural wetland vegetation and identifying the dominant species currently present.
- **Buffer zone assessment:** A 500 m buffer on either side of the transmission line was assessed to capture both direct and indirect zones of influence. This allowed evaluation of adjacent land use activities, such as agriculture, settlements and infrastructure, that may affect wetland integrity and function.
- **Spatial analysis and mapping:** Wetlands were identified, mapped and characterized using available project maps and geospatial data, which were verified during field surveys. The mapping supported:
  - Confirmation of wetland locations and extents;
  - Identification of transmission line crossing points; and
  - Understanding of surrounding land use and potential impact zones.
- **Biodiversity assessment:** Flora and fauna were identified through direct field observation, complemented by species information compiled during the ESIA baseline study. The assessment confirmed that the wetlands are dominated by common and widely distributed species, with no protected or endangered species present along the corridor.
- **Stakeholder consultations:** Discussions with local communities and authorities provided additional insight into:
  - Historical land use changes within the wetlands;
  - Current agricultural practices;
  - Seasonal variations in wetland conditions; and
  - Community dependence on wetland resources.
- **Literature and regulatory review:** The assessment was further supported by a review of relevant national regulations and ecological references, including the Ministerial Order establishing the list of protected animal and plant species in Rwanda (No. 007/2008), to confirm that no protected species are affected within the project area.

In addition, the assessment evaluated wetland functions and potential project-related impacts by analysing the interaction between project activities (such as tower construction, access and vegetation clearing) and wetland characteristics. Impacts were identified and qualitatively assessed according to their nature, spatial extent, duration and reversibility, following the mitigation hierarchy (avoidance, minimization, restoration). Particular attention was given to key wetland functions, including water retention, soil stabilization and support to local agricultural livelihoods.

4. Policy, Legal and Institutional Framework

The WMP is guided by:

- National environmental and biodiversity regulations;
- Wetland protection provisions under Rwandan environmental law;
- Ministerial Order No. 007/2008 of 15/08/2008 establishing the list of protected animal and plant species; and
- The World Bank Environmental and Social Framework, in particular ESS6.

5. Description of Wetlands in the Project Area

5.1 Overview

A total of six (6) wetlands will be traversed by the transmission line:

Ruhango District (5 wetlands)

- Gasenyi–Rwamikara
- Kamugongo–Bakoni–Kamonyi–Gahengeri
- Nyabikone
- Nyamugafi
- Urugondo

Muhanga District (1 wetland)

- Rugeramigozi

5.2 Wetland Typology and Characteristics

Based on field observations and land use characteristics, all wetlands within the project area can be classified as modified valley-bottom wetland systems, typical of Rwanda's central plateau. These wetlands have lost their natural ecological structure and are currently used for intensive agriculture.

Table 1: Wetland Typology in the Project Area

Wetland Name	District / Sector	Typology	Hydrological Regime	Current Land Use
Rugeramigozi	Muhanga / Nyamabuye	Valley-bottom wetland (modified)	Permanent	Intensive agriculture (maize dominant)

Wetland Name	District / Sector	Typology	Hydrological Regime	Current Land Use
Gasenyi–Rwamikara	Ruhango / Byimana	Valley-bottom wetland (modified)	Seasonal	Mixed crops
Kamugongo–Bakoni–Kamonyi–Gahengeri	Ruhango / Byimana	Valley-bottom wetland (modified)	Seasonal	Mixed agriculture
Nyabikone	Ruhango / Byimana	Valley-bottom wetland (modified)	Seasonal	Maize and beans
Nyamugafi	Ruhango / Byimana	Valley-bottom wetland (modified)	Seasonal	Mixed crops
Urugondo	Ruhango / Mbuye and Ruhango	Valley-bottom wetland (modified, wetter conditions)	Seasonal	Agriculture with dominant grasses

Summary: All wetlands are anthropogenically modified systems in which natural vegetation has been replaced by crops and grasses. No intact or natural wetland types (e.g. papyrus swamps) were identified within the project corridor or its buffer zone.

5.3 Ecology

5.3.1 Flora (Vegetation)

The ecological assessment indicates that vegetation within the transmission line corridor and associated wetlands is highly modified and dominated by anthropogenic land uses, particularly subsistence and small-scale agriculture. Field observations confirmed that natural wetland vegetation communities, such as papyrus-dominated ecosystems, are absent, and that the area has undergone long-term transformation through farming and settlement.

The dominant vegetation types are annual and perennial crops, interspersed with grasses used for soil stabilization and a limited number of planted trees, mainly for economic use and boundary demarcation. Wetland areas are intensively cultivated with crops such as maize, beans, cassava, potatoes and colocasia, while grasses such as *Pennisetum purpureum* (elephant grass) and *Pennisetum clandestinum* (Kikuyu grass) are commonly used for erosion control and fodder.

Tree cover is sparse within the wetlands themselves but more common along their fringes, where it is dominated by *Eucalyptus* species, with scattered agroforestry and fruit trees such as grevillea, avocado, mango and guava.

Importantly, no protected or endangered plant species were identified during the field surveys. This is consistent with Ministerial Order No. 007/2008 of 15/08/2008 establishing the list of protected plant species in Rwanda, and confirms that the project area does not host flora of conservation concern.

Table 2: Dominant Flora in the Project Area

Category	Common Name	Scientific Name	Occurrence	Ecological / Use Function
Staple crops	Maize	*Zea mays*	Very common (dominant)	Food crop
Staple crops	Beans	*Phaseolus vulgaris*	Very common	Food crop; soil nitrogen fixation
Staple crops	Cassava	*Manihot esculenta*	Common	Food security crop
Staple crops	Potatoes	*Solanum tuberosum*	Common	Food crop
Staple crops	Colocasia (taro)	*Colocasia esculenta*	Wetland-specific	Food crop
Grasses	Elephant grass	*Pennisetum purpureum*	Very common	Soil stabilization, fodder
Grasses	Kikuyu grass	*Pennisetum clandestinum*	Common (especially wetter zones)	Soil cover, grazing
Trees (dominant)	Eucalyptus	*Eucalyptus* spp.	Very common (wetland edges)	Fuelwood, boundary demarcation
Agroforestry trees	Grevillea	*Grevillea robusta*	Common	Shade, soil improvement
Fruit trees	Avocado	*Persea americana*	Scattered	Food / income generation
Fruit trees	Mango	*Mangifera indica*	Scattered	Food / income generation
Fruit trees	Guava	*Psidium guajava*	Scattered	Food / income generation
Fruit trees	Citrus (lemon / orange)	*Citrus* spp.	Scattered	Food / income generation

5.3.2 Fauna (Wildlife)

The fauna of the project area is typical of human-modified agricultural and peri-urban landscapes, with species adapted to disturbed environments. The ecological survey, supported by field observations and literature review, confirmed that wildlife diversity is low to moderate and dominated by common, widespread species.

Avifauna (birds)

Bird species observed in the wetlands and surrounding agricultural areas are primarily generalists that are highly adaptable to human activity. These species are widely distributed across Rwanda and sub-Saharan Africa and are classified as Least Concern (LC) on the IUCN Red List.

Herpetofauna (amphibians and reptiles)

The wetlands and adjacent farmland provide suitable microhabitats for frogs, toads and reptiles, particularly in moist and cultivated areas. These species play an important ecological role in pest control and in maintaining ecosystem balance.

No endangered, rare or legally protected fauna species were recorded during the field survey. This is consistent with national conservation listings and reflects the already degraded nature of habitats within the project corridor.

Table 3: Representative Fauna Species Recorded in the Project Area (full inventory in Annex 2)

Faunal Group	Common Name	Scientific Name	Conservation Status (IUCN)	Habitat / Occurrence
Birds	Pied Crow	*Corvus albus*	Least Concern (LC)	Farmland, settlements
Birds	Cattle Egret	*Bubulcus ibis*	Least Concern (LC)	Wetlands, agricultural fields
Birds	Sacred Ibis	*Threskiornis aethiopicus*	Least Concern (LC)	Wetlands
Birds	Grey-headed Sparrow	*Passer griseus*	Least Concern (LC)	Settlements, farms
Birds	Long-crested Eagle	*Lophaetus occipitalis*	Least Concern (LC)	Open fields, roadside trees
Amphibians	Common Reed Frog	*Hyperolius viridiflavus*	Least Concern (LC)	Wetlands, moist vegetation
Amphibians	African Common Toad	*Sclerophrys regularis*	Least Concern (LC)	Farmland, wetlands
Reptiles	Speckled Bush Snake	*Philothamnus semivariegatus*	Least Concern (LC)	Vegetation, farms
Reptiles	Brown House Snake	*Boaedon capensis*	Least Concern (LC)	Settlements, agricultural areas
Reptiles	Variable Bush Viper	*Atheris squamigera*	Least Concern (LC)	Vegetation near wetlands

5.3.3 Ecological Significance

Overall, the ecological value of the project area is considered **low to moderate** owing to:

- Extensive conversion of natural habitats to agricultural land
- Absence of intact wetland ecosystems
- Absence of protected or endangered species
- Dominance of common and resilient flora and fauna

The wetlands nevertheless still provide localized ecological functions, including:

- Soil moisture retention
- Habitat for common bird and amphibian species

- Microclimate regulation

However, these functions are already significantly altered by ongoing human activities.

5.4 Wetland Systems along the Transmission Line Corridor

The proposed 21 km transmission line traverses a total of six (6) wetlands. Five (5) are in Ruhango District, while only one, Rugeramigozi, is in Muhanga District (Nyamabuye Sector, Gahogo Cell). The distribution of these wetlands along the corridor is shown in the overall map (Figure 1). Individual wetland maps are included in the respective subsections below for site-specific reference.

Field verification combined with map analysis confirms that the transmission line alignment has been optimized to avoid tower placement within wetlands and on steep slopes. No tower is located on a slope exceeding 12%; the steepest tower location recorded (AP2) has a slope of only 5.9%, which is within acceptable engineering and environmental limits.

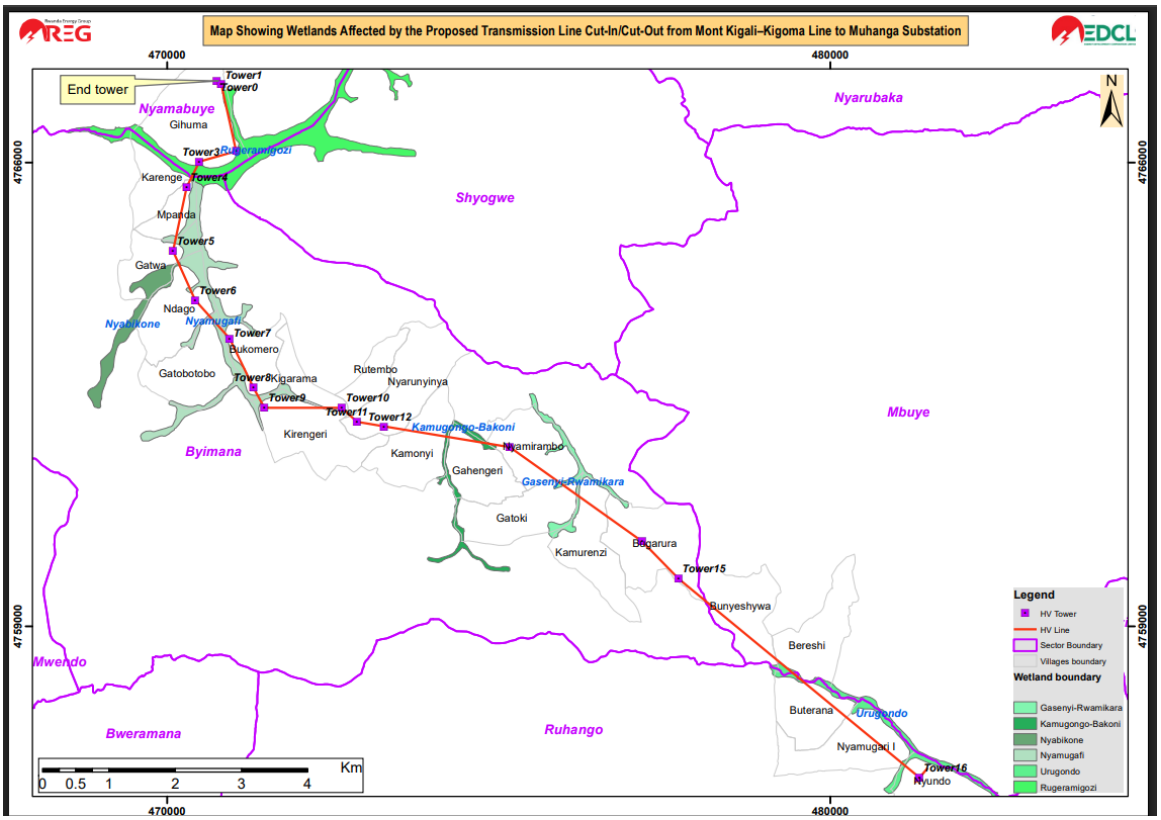

Figure 1: Overall map of wetlands along the transmission line corridor

5.4.1 Wetlands in Muhanga District

Rugeramigozi Wetland (Nyamabuye Sector, Gahogo Cell)

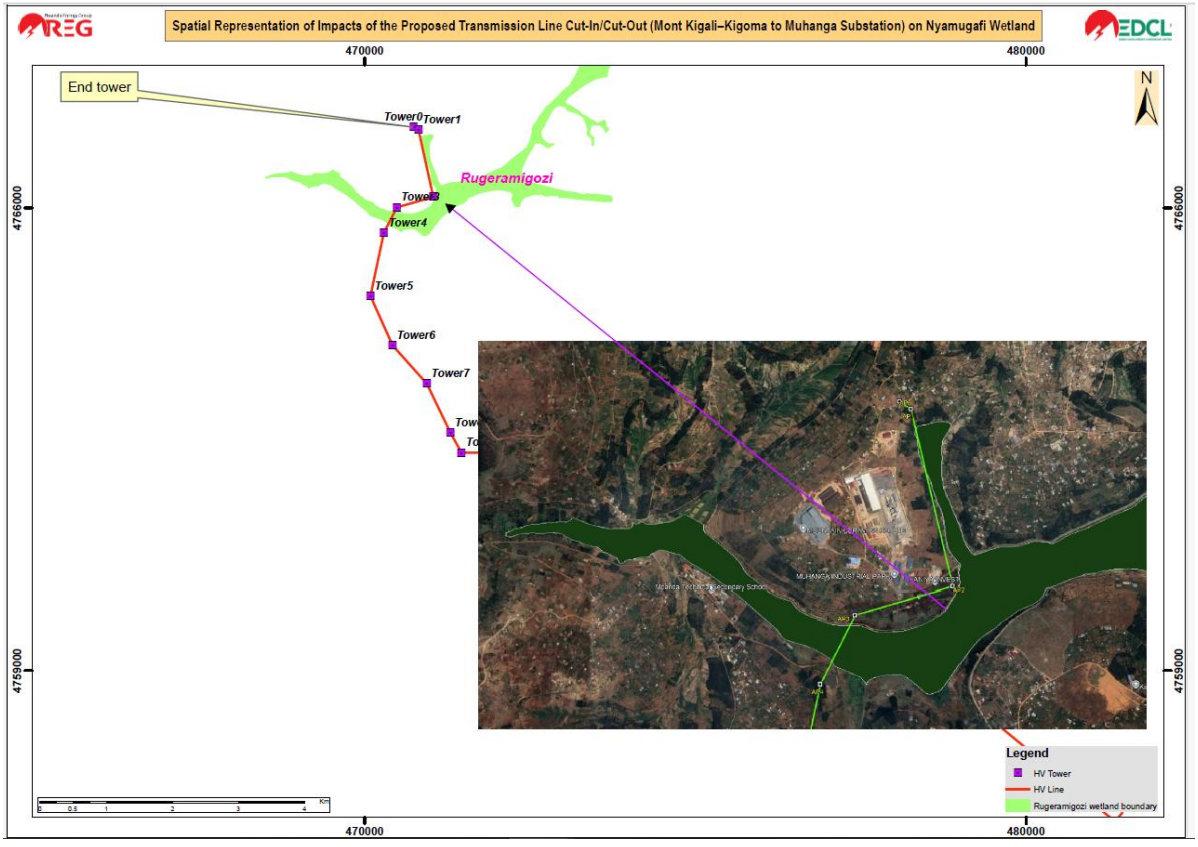

Figure 2: Rugeramigozi Wetland map

Rugeramigozi is the largest wetland crossed by the transmission line. It lies adjacent to the Muhanga Industrial Park, from which it is separated by a paved (macadamized) road, and is also intersected by National Road NR1 (Kigali–Muhanga–Nyanza–Huye–Akanyaru), reflecting a high level of existing anthropogenic disturbance.

The wetland is fully transformed and degraded and is used primarily for year-round agriculture, dominated by maize alongside beans, cassava and other seasonal crops. The vegetation structure is largely modified, with *Pennisetum purpureum* (elephant grass) used for erosion control and *Eucalyptus* species planted along the periphery for boundary demarcation and economic purposes.

Despite this degradation, the wetland still provides limited habitat for common and adaptable bird species, including Pied Crow, Cattle Egret, Sacred Ibis and Grey-headed Sparrow, all classified as Least Concern globally.

Field surveys and review of Ministerial Order No. 007/2008 of 15/08/2008 confirmed that no protected plant or animal species are present within this wetland or its immediate zone of influence.

5.4.2 Wetlands in Ruhango District

A total of five (5) wetlands are traversed in Ruhango District, distributed across Byimana, Mbuye and Ruhango sectors. These wetlands are smaller and more fragmented than Rugeramigozi but show similar levels of anthropogenic modification.

Gasenyi–Rwamikara Wetland (Byimana Sector)

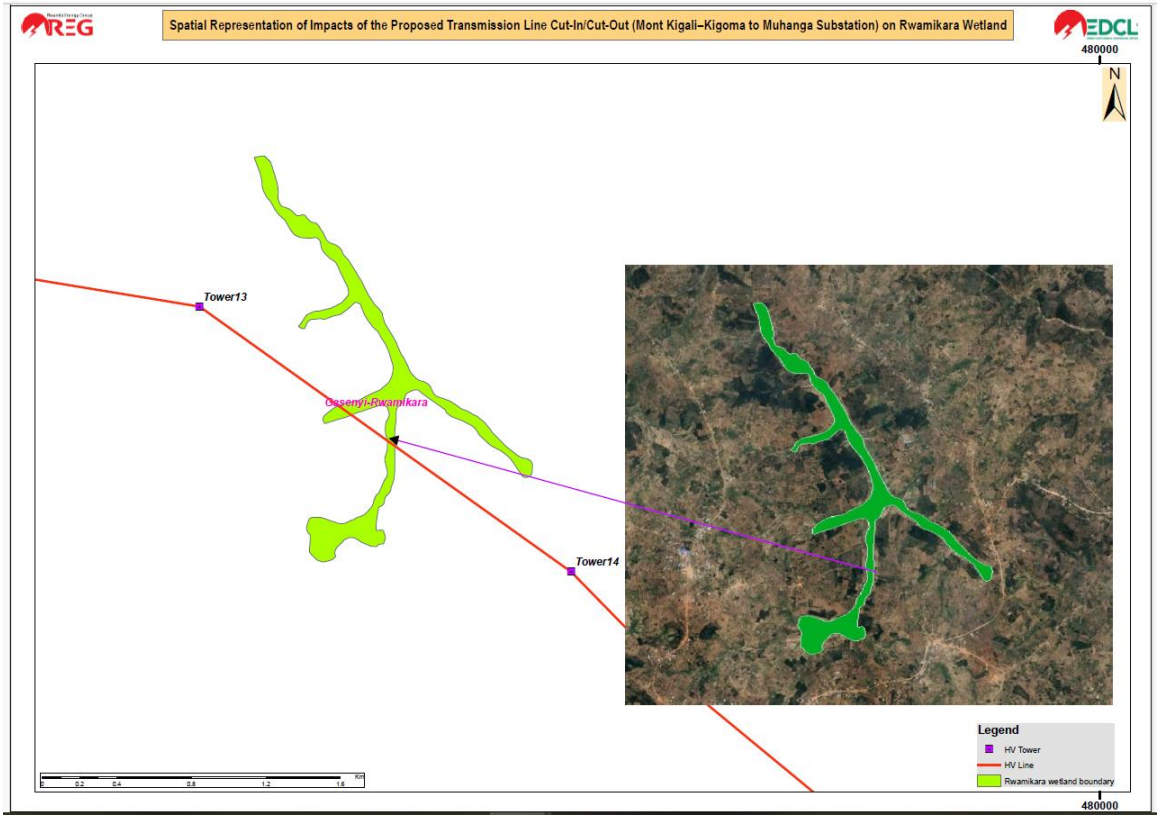

Figure 3: Gasenyi–Rwamikara Wetland map

This wetland is intensively farmed, with crops such as maize, beans and cassava. Riparian vegetation is minimal, and hydrological conditions have been altered by farming activities.

Kamugongo–Bakoni–Kamonyi–Gahengeri Wetland (Byimana Sector, Kirengeri Cell)

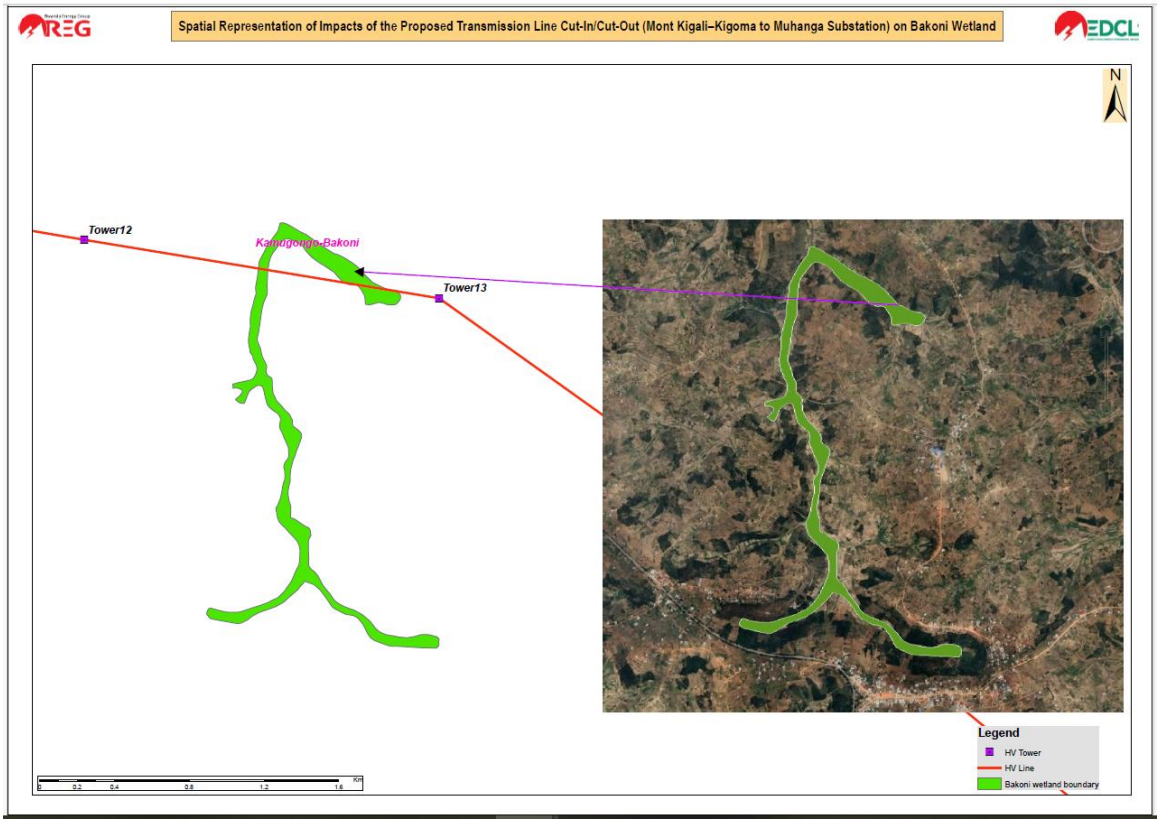

Figure 4: Kamugongo–Bakoni–Kamonyi–Gahengeri Wetland map

This wetland extends across Kamonyi and Gahengeri villages and is similarly cultivated. Vegetation is dominated by seasonal crops, with *Eucalyptus* plantations along the edges and scattered grasses.

Nyabikone Wetland (Byimana Sector, Muhororo and Mpanda Cells)

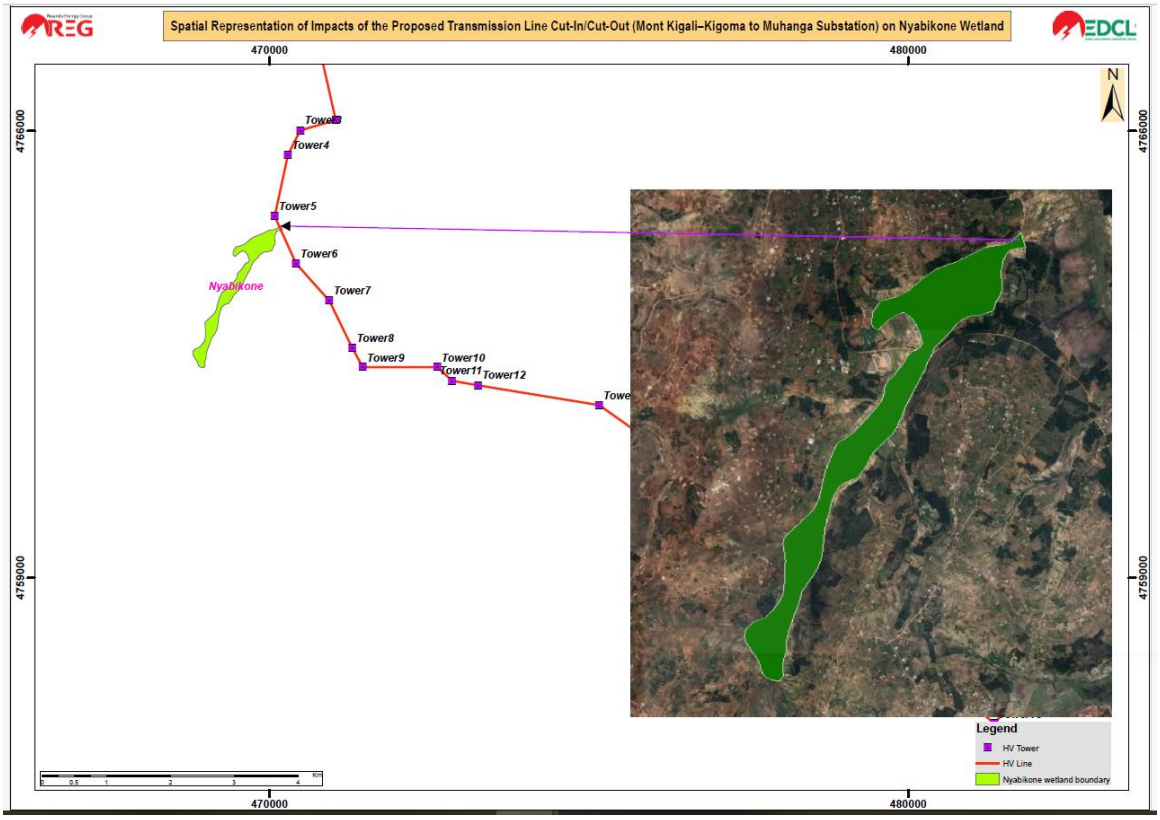

Figure 5: Nyabikone Wetland map

Nyabikone wetland is moderately fragmented and used for mixed farming. Soil protection measures such as grass strips (*Pennisetum purpureum*) are present in some sections.

Nyamugafi Wetland (Byimana Sector, Muhororo and Mpanda Cells)

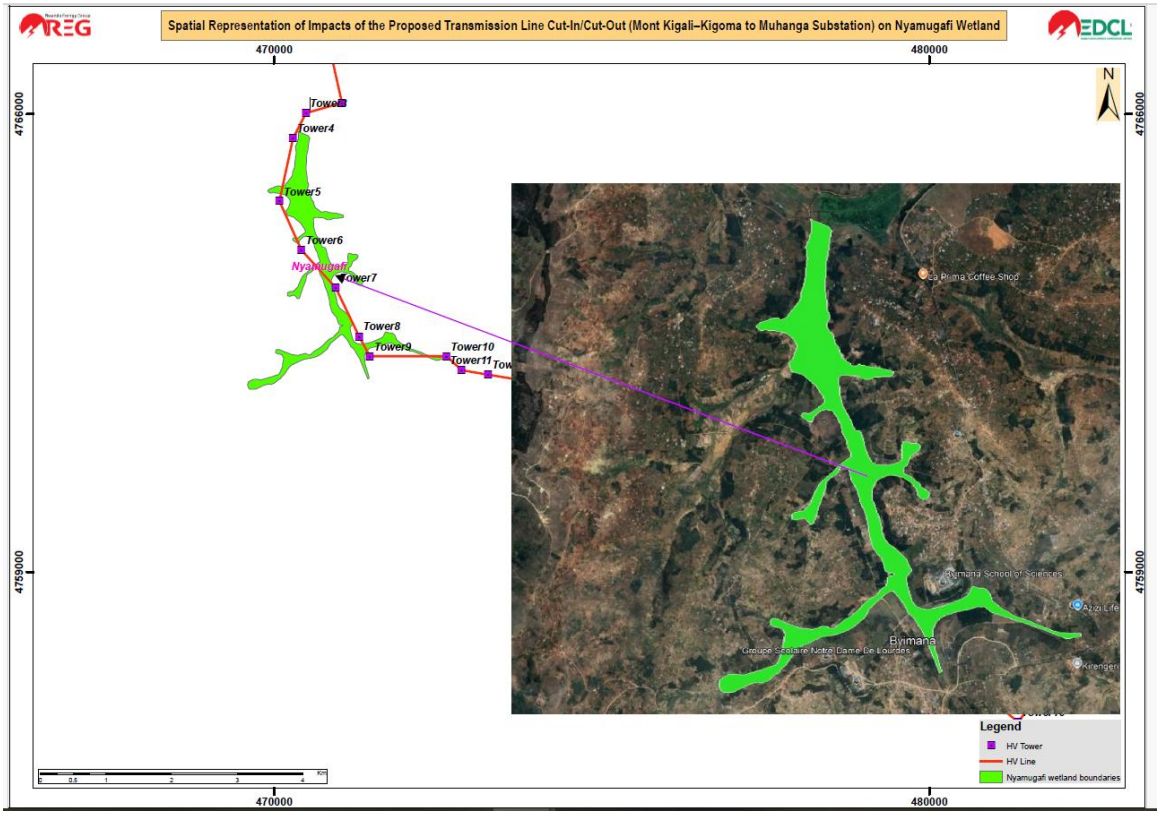

Figure 6: Nyamugafi Wetland map

This wetland shows similar agricultural pressure, with continuous cultivation and reduced natural vegetation. Hydrological flow paths are partially modified by land use practices.

Urugondo Wetland (Mbuye and Ruhango Sectors)

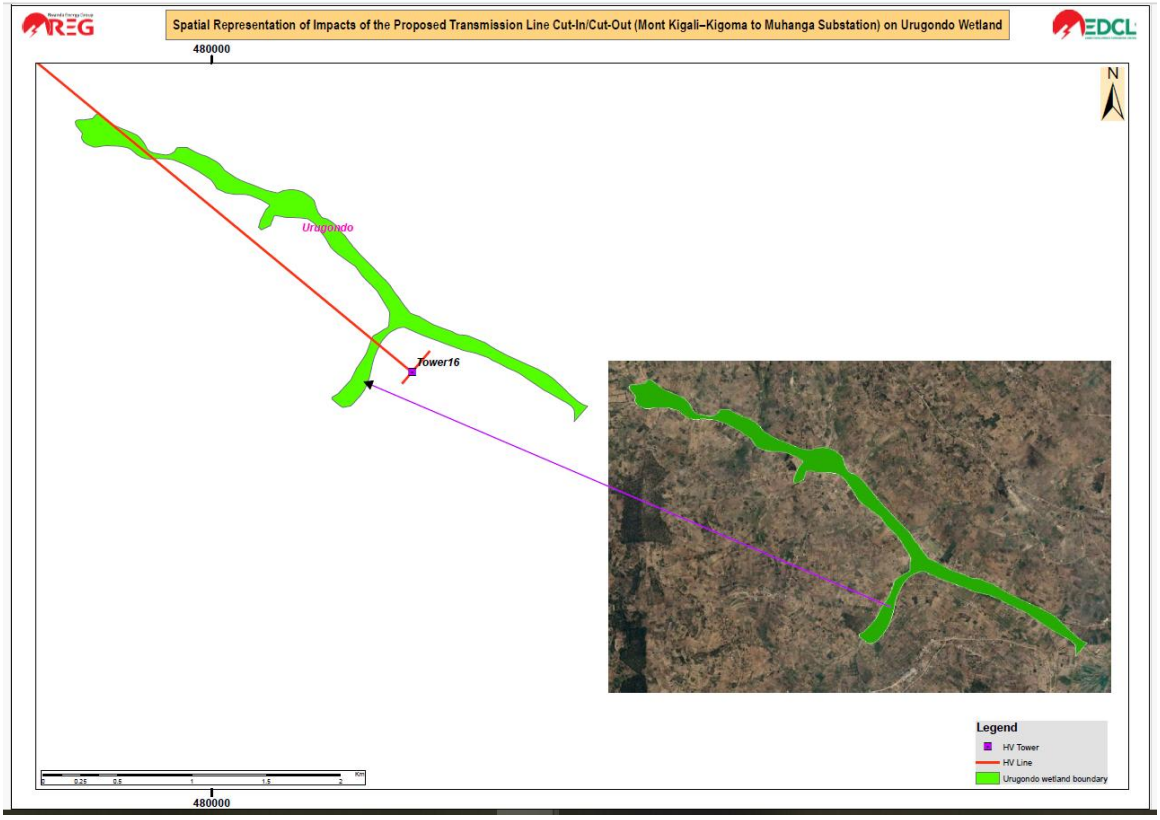

Figure 7: Urugondo Wetland map

Urugondo wetland extends across Mbuye and Ruhango sectors. It is wetter than the other wetlands, with *Pennisetum clandestinum* (Kikuyu grass) dominating uncultivated patches. Despite the wetter conditions, cultivation (maize, beans, cassava) is still practised.

5.4.3 General Wetland Characteristics and Condition

All wetlands within the project corridor are heavily degraded and fully converted to agricultural use, with no intact or natural wetland ecosystems remaining within the 500 m buffer zone on either side of the transmission line. The dominant land uses are:

- Subsistence and small-scale farming (maize, beans, cassava, potatoes, colocasia)
- Soil stabilization using grasses (*Pennisetum* spp.)
- Peripheral tree planting (mainly *Eucalyptus*)

The ecological integrity of these wetlands is therefore low, with limited biodiversity value, primarily supporting common and adaptable species. No critical habitats or legally protected ecosystems are affected by the project.

5.4.4 Relevance to the Project

The interaction between the transmission line and the wetlands is limited to overhead crossing, with:

- No tower foundations located within wetlands
- No direct obstruction of drainage expected

- A minimal permanent footprint, restricted to tower bases outside wetland boundaries

Potential impacts are therefore temporary and indirect, mainly related to:

- Soil disturbance during access
- Localized sedimentation risks
- Temporary vegetation clearing

These impacts are addressed through this WMP and the ESMP, including erosion control, restricted access routes and restoration of disturbed areas.

5.5 Wetland Delineation Methodology (Field-Based Approach)

Wetlands traversed by the proposed transmission line were delineated through a combination of field surveys and spatial analysis. Field visits were conducted along the entire corridor, including all identified wetland crossing points, to verify the extent and characteristics of wetland areas.

During the field surveys, wetlands were identified and delineated on the basis of observable indicators, including: (i) the presence of hydrophytic or moisture-tolerant vegetation, such as *Pennisetum purpureum* and other grasses; (ii) soil conditions indicative of prolonged moisture (e.g. dark, clayey or waterlogged soils); and (iii) evidence of seasonal or permanent water and drainage patterns. These observations were complemented by existing maps and satellite imagery (KMZ provided), which were used to confirm wetland boundaries and extent.

The delineation was further validated through ground-truthing using GPS-referenced points, ensuring that all wetland crossings and their immediate zones of influence were accurately captured. A 500 m buffer on either side of the transmission line was considered to evaluate the broader ecological and hydrological context, although direct impacts are limited to the right-of-way (RoW). The results confirm that all mapped wetlands are already significantly modified by agricultural activities.

5.6 Wetland Condition Assessment

The ecological condition of wetlands within the project area was assessed on the basis of vegetation composition, land use intensity, hydrological modification and the presence or absence of natural habitat features.

Table 4: Wetland Condition Assessment

Wetland Name	Condition Status	Justification
Rugeramigozi	Highly degraded	Fully cultivated; close to industrial park and national road; no natural vegetation
Gasenyi–Rwamikara	Highly degraded	Intensive agriculture; absence of native wetland species
Kamugongo–Bakoni–Kamonyi–Gahengeri	Highly degraded	Converted to farmland; dominated by seasonal crops
Nyabikone	Highly degraded	Continuous cultivation; no ecological wetland features

Wetland Name	Condition Status	Justification
Nyamugafi	Highly degraded	Modified hydrology; fully used for agriculture
Urugondo	Moderately to highly degraded	Higher moisture retention but still cultivated; dominance of grasses

Key observations:

- All wetlands are fully converted to agricultural use
- No papyrus (*Cyperus papyrus*) ecosystems or intact wetland habitats were identified
- Vegetation is dominated by maize, beans and grasses, with *Pennisetum purpureum* used for erosion control
- No protected plant or animal species were recorded, as confirmed through field surveys and reference to Ministerial Order No. 007/2008

5.7 Summary of Wetland Assessment

The wetland assessment confirms that:

- All wetlands traversed by the transmission line are degraded and highly modified ecosystems
- The project design avoids direct impacts by ensuring that:
  - No towers are located within wetlands
  - The transmission line crosses wetlands overhead only
- The ecological sensitivity of the wetlands is low, but they remain important for:
  - Local agriculture
  - Water regulation at a micro-scale

Therefore, while impacts are expected to be limited and manageable, implementation of this WMP remains necessary to:

- Control construction-related risks (erosion, pollution)
- Ensure restoration of temporarily disturbed areas
- Maintain existing hydrological functions

6. Impact Assessment

6.1 Approach and Methodology

The impact assessment for wetlands potentially affected by the transmission line project was based on:

- Field observations along the transmission line corridor and at wetland crossings
- Review of the project design (alignment, tower locations, RoW width of 25 m)
- Analysis of baseline ecological conditions, including vegetation, hydrology and land use
- Consideration of construction and operation activities and their interaction with wetland systems

Impacts were assessed for the pre-construction, construction and operation phases and evaluated according to their:

- Nature (positive / negative)
- Extent (localized / regional)
- Duration (temporary / permanent)
- Magnitude (low / moderate / high)
- Significance (before and after mitigation)

Given that all wetlands are already degraded and used for agriculture, the sensitivity of these ecosystems is considered low to moderate, which influences the overall significance of impacts.

6.2 Summary of Key Project Interactions with Wetlands

The main interactions between the project and the wetlands are:

- Overhead crossing of wetlands by the transmission line
- Temporary construction access near wetland edges
- Vegetation clearing within the RoW
- Movement of machinery and workforce near wetland areas

Importantly:

- No transmission towers will be constructed within wetlands
- No permanent land take within wetlands is required
- Hydrological flow paths are not expected to be obstructed

6.3 Potential Impacts during the Pre-Construction Phase

6.3.1 Land Acquisition and Livelihood Impacts

Although the wetlands themselves will not be permanently acquired, some adjacent agricultural land may be affected by tower locations.

Potential impacts:

- Loss of crops cultivated in wetland areas
- Temporary disruption of farming activities

Impact characterization:

- **Nature:** Negative
- **Extent:** Localized
- **Duration:** Short-term
- **Magnitude:** Low
- **Significance:** Low

6.4 Potential Impacts during the Construction Phase

6.4.1 Soil Disturbance and Erosion

Construction activities near wetlands (e.g. movement of workers and equipment access) may disturb soils and increase erosion risk.

Potential impacts:

- Soil loosening and exposure
- Increased sediment transport into wetlands

- Degradation of soil conservation structures (e.g. bunds, terraces)

Impact characterization:

- **Nature:** Negative
- **Extent:** Localized
- **Duration:** Short-term
- **Magnitude:** Moderate
- **Significance:** Moderate (before mitigation) → Low (after mitigation)

6.4.2 Sedimentation and Water Quality Degradation

Disturbed soils may be washed into wetland systems during rainfall events.

Potential impacts:

- Increased turbidity in wetlands
- Siltation of drainage channels
- Reduced water quality for downstream users

Impact characterization:

- **Nature:** Negative
- **Extent:** Localized
- **Duration:** Temporary
- **Magnitude:** Moderate
- **Significance:** Moderate → Low (with mitigation)

6.4.3 Vegetation Clearance

Vegetation within the 25 m RoW may be cleared, including crops and grasses at wetland edges.

Potential impacts:

- Loss of crops (maize, beans, etc.)
- Removal of erosion-control vegetation (e.g. *Pennisetum purpureum*)

Impact characterization:

- **Nature:** Negative
- **Extent:** Localized
- **Duration:** Temporary (regrowth possible)
- **Magnitude:** Low
- **Significance:** Low

6.4.4 Disturbance to Fauna

Construction activities may temporarily disturb wildlife, particularly birds and amphibians.

Potential impacts:

- Displacement caused by noise and human presence
- Temporary disruption of feeding or breeding

Impact characterization:

- **Nature:** Negative

- **Extent:** Localized
- **Duration:** Short-term
- **Magnitude:** Low
- **Significance:** Low

Note: Because the species present are common and adaptable (Least Concern), impacts are expected to be minimal.

6.4.5 Pollution Risks (Fuel, Oil, Waste)

Construction machinery may introduce pollutants if not properly managed.

Potential impacts:

- Accidental spills of fuel or lubricants
- Improper waste disposal near wetlands

Impact characterization:

- **Nature:** Negative
- **Extent:** Localized
- **Duration:** Short-term (but potentially severe if unmanaged)
- **Magnitude:** Moderate
- **Significance:** Moderate → Low (with proper controls)

6.4.6 Temporary Disruption of Wetland Use

Farmers using the wetlands may experience temporary access restrictions.

Potential impacts:

- Interruption of farming activities
- Reduced access to plots during construction

Impact characterization:

- **Nature:** Negative
- **Extent:** Localized
- **Duration:** Temporary
- **Magnitude:** Low
- **Significance:** Low

6.5 Potential Impacts during the Operation Phase

6.5.1 Long-Term Vegetation Management

Vegetation within the RoW will require periodic maintenance.

Potential impacts:

- Continued restriction of tall vegetation growth
- Preference for low-growing crops and grasses

Impact characterization:

- **Nature:** Negative / neutral
- **Extent:** Localized

- **Duration:** Long-term
- **Magnitude:** Low
- **Significance:** Low

6.5.2 Electromagnetic Fields (EMF): Ecological Aspect

No significant ecological effects of EMF on wetland fauna are expected at typical exposure levels.

Impact characterization:

- **Nature:** Negligible
- **Significance:** Insignificant

6.5.3 Bird Collision Risk

Birds may collide with transmission lines, especially over wetland areas.

Potential impacts:

- Occasional bird mortality

Impact characterization:

- **Nature:** Negative
- **Extent:** Limited
- **Duration:** Long-term
- **Magnitude:** Low
- **Significance:** Low

Note: The risk is low because of:

- Low bird density
- Absence of migratory corridors
- Presence of common species only

6.6 Cumulative Impact Assessment

Given that:

- The wetlands are already highly degraded
- Agricultural activities are ongoing
- Infrastructure (roads, settlements) already exists

the project is not expected to contribute significantly to cumulative ecological degradation. Instead:

- Impacts are incremental and localized
- No critical thresholds are expected to be exceeded

6.7 Impact Significance Summary

Table 5: Summary of Wetland-Related Impacts

Impact	Phase	Magnitude	Significance (before mitigation)	Significance (after mitigation)
Soil erosion	Construction	Moderate	Moderate	Low
Sedimentation	Construction	Moderate	Moderate	Low
Vegetation loss	Construction	Low	Low	Low
Water pollution (spills)	Construction	Moderate	Moderate	Low
Fauna disturbance	Construction	Low	Low	Low
Livelihood disruption	Pre-construction / construction	Low	Low	Low
Bird collision	Operation	Low	Low	Low
Vegetation maintenance	Operation	Low	Low	Low

6.8 Conclusion of Impact Assessment

The assessment concludes that:

- All identified impacts on wetlands are localized, temporary and of low to moderate magnitude
- The absence of tower construction within wetlands significantly reduces risk
- The already degraded condition of the wetlands lowers their ecological sensitivity
- With proper mitigation, all impacts can be reduced to acceptable (low) levels

The project is therefore considered environmentally acceptable from a wetland perspective, provided that the mitigation measures set out in this WMP are effectively implemented.

7. Mitigation Measures

7.1 Design Phase

- Avoid siting towers within wetlands *(already implemented)*
- Minimize crossing lengths
- Maintain natural drainage pathways

7.2 Construction Phase

- Establish buffer zones (≥30 m where feasible)
- Install erosion and sediment control structures
- Prohibit storage of hazardous materials near wetlands
- Restrict machinery movement within wetland areas
- Rehabilitate disturbed areas immediately

7.3 Operation Phase

- Apply controlled vegetation management
- Avoid herbicide use near wetlands
- Carry out routine inspection and maintenance

8. Wetland Restoration and Enhancement

- Replant native grasses along disturbed edges
- Stabilize soils using bioengineering methods
- Promote sustainable agricultural practices
- Raise community awareness of wetland conservation

9. Monitoring Plan

Table 6 sets out the monitoring indicators, methods, frequency, responsibilities, targets and reporting arrangements for implementing this WMP.

Table 6: Wetland Monitoring Plan

Impact / Aspect	Monitoring Indicator	Method of Verification	Location	Frequency	Responsibility	Performance Target / Standard	Reporting
Soil erosion and sedimentation	Presence of soil erosion (rills, gullies); sediment deposition in wetlands	Visual inspection; photographic records	Wetland crossings and adjacent slopes	Weekly during construction; after heavy rainfall	Contractor (E&S Officer); Supervising Engineer	No active erosion; no sediment accumulation in wetlands	Monthly report to PIU/EDCL
Vegetation disturbance and restoration	Area cleared vs. restored; regrowth of grasses and crops	Field inspection; comparison with baseline	RoW near wetlands	Monthly during construction; quarterly during operation	Contractor; District Environment Officer	≥90% revegetation of disturbed areas within 3 months	Included in ESMP monitoring report
Water quality (turbidity / pollution)	Turbidity (visual clarity); presence of oil, grease or waste	Visual inspection; simple turbidity observation (or field kits if available)	Wetland water bodies downstream of works	Weekly during construction	Contractor; Supervising Engineer	No visible oil films; no abnormal increase in turbidity	Incident-based and monthly reporting

Impact / Aspect	Monitoring Indicator	Method of Verification	Location	Frequency	Responsibility	Performance Target / Standard	Reporting
Pollution (fuel, oil, waste)	Evidence of spills; proper storage of fuels and materials	Site inspection; storage area checks	Construction sites near wetlands	Weekly	Contractor (HSE Officer)	Zero spills; proper containment systems in place	Immediate reporting of incidents
Wetland hydrology	Evidence of blocked or altered water flow (ponding, diversion)	Visual inspection; drainage path checks	Wetland crossing points	Weekly during construction	Supervising Engineer; PIU Safeguards Team	Natural flow maintained; no obstruction observed	Monthly report
Fauna disturbance	Presence / absence of birds and amphibians; abnormal behaviour	Field observation	Wetlands and surrounding areas	Monthly	Contractor; Environmental Specialist	No significant decline in observable fauna activity	Quarterly report
Bird collision risk (operation phase)	Bird mortality incidents under transmission lines	Field patrols; incident logs	Wetland crossing sections	Quarterly (operation phase)	EDCL Maintenance Team	No significant mortality trends	Annual environmental report
Waste management	Waste segregation; absence of dumping in wetlands	Site inspection; waste tracking records	All construction areas near wetlands	Weekly	Contractor; Supervising Engineer	100% of waste properly managed; no dumping in wetlands	Monthly report

Impact / Aspect	Monitoring Indicator	Method of Verification	Location	Frequency	Responsibility	Performance Target / Standard	Reporting
Community complaints (wetland-related)	Number and type of wetland-related grievances (water, land use, access)	Grievance log review	Project-affected communities	Monthly	PIU/EDCL; local authorities	All grievances resolved within the set timeframe	Included in GRM report
Livelihood restoration (wetland users)	Completion of compensation; restoration of access to farmland	RAP monitoring reports; field verification	Wetland-dependent households	Monthly (pre-construction and during construction)	PIU/EDCL; RAP Team	100% compensation before impact; access restored	RAP monitoring report
Compliance with buffer zones and restrictions	No encroachment of machinery into wetlands	Site inspection; supervision logs	All wetland sections	Continuous during works	Supervising Engineer	Zero unauthorized entry into wetland zones	Weekly supervision report

10. Institutional Arrangements

- **REG/EDCL:** overall oversight
- **Contractor:** implementation
- **Supervising firm:** monitoring
- **District authorities:** local enforcement

11. Capacity Building

- Training of contractors on wetland protection
- Worker awareness programmes
- Community sensitization initiatives

12. Budget

Costs are integrated into the ESMP and include:

- Erosion control measures
- Rehabilitation works
- Monitoring activities

13. Conclusion

The wetlands affected by the project are already highly degraded and have limited ecological sensitivity. However, they remain important for hydrology and local livelihoods.

With the implementation of this Wetland Management Plan, the project will:

- Avoid significant impacts;
- Maintain wetland functionality; and
- Provide opportunities for localized environmental improvement.

14. Annexes

- **Annex 1:** Wetland GIS Maps (KMZ files, not reproduced in this report; available separately from the report on request)
- **Annex 2:** Detailed Species Inventory

Annex 2: Detailed Species Inventory

A2.1 Introduction

This annex presents the detailed inventory of flora and fauna species recorded and/or expected within the project area, based on:

- Field surveys along the transmission line corridor and wetland crossings
- Direct observations during site visits
- Consultations with local communities
- Review of available literature on biodiversity in the Southern Province of Rwanda, particularly Muhanga and Ruhango districts

The inventory reflects the highly modified nature of the project area, which is dominated by agriculture and human settlements, with wetlands that are fully degraded and cultivated. As a result, biodiversity is characterized by common, adaptable species, with no records of endangered or protected species.

A2.2 Flora Species Inventory

A2.2.1 General Vegetation Characteristics

Vegetation in the project area consists primarily of:

- Food crops (dominant land cover)
- Grasses for soil stabilization and grazing
- Scattered agroforestry and fruit trees
- Limited remnants of natural vegetation

No natural papyrus (*Cyperus papyrus*) ecosystems were identified.

Table A2.1: Flora Species Inventory

Category	Common Name	Scientific Name	Local Name (Kinyarwanda)	Habitat / Location	Abundance	Use / Function
Staple crops	Maize	*Zea mays*	Ibigori	Wetlands, uplands	Very high	Food crop
Staple crops	Beans	*Phaseolus vulgaris*	Ibishyimbo	Wetlands, farms	Very high	Food, nitrogen fixation
Staple crops	Cassava	*Manihot esculenta*	Imyumbati	Farms, wetland edges	High	Food security
Staple crops	Potatoes	*Solanum tuberosum*	Ibirayi	Uplands	High	Food
Staple crops	Taro	*Colocasia esculenta*	Amateke	Wetlands	Moderate	Food

Category	Common Name	Scientific Name	Local Name (Kinyarwanda)	Habitat / Location	Abundance	Use / Function
Grasses	Elephant grass	*Pennisetum purpureum*	Urubingo	Wetlands, bunds	Very high	Erosion control, fodder
Grasses	Kikuyu grass	*Pennisetum clandestinum*	–	Wetlands (Urugondo)	High	Grazing, soil cover
Tree species	Eucalyptus	*Eucalyptus* spp.	Inturusu	Wetland edges, farms	Very high	Fuelwood, construction
Tree species	Grevillea	*Grevillea robusta*	Greveriya	Farms	Moderate	Agroforestry
Fruit trees	Avocado	*Persea americana*	Avoka	Homesteads	Moderate	Food / income
Fruit trees	Mango	*Mangifera indica*	Umwembe	Homesteads	Moderate	Food / income
Fruit trees	Guava	*Psidium guajava*	Amapera	Farms	Moderate	Food
Fruit trees	Citrus	*Citrus* spp.	Indimu / Amacunga	Homesteads	Low–moderate	Food
Other plants	Banana	*Musa* spp.	Ibitoki	Farms, wetlands	High	Food / income
Other plants	Sugarcane	*Saccharum officinarum*	Ibisheke	Wetlands	Low–moderate	Cash crop
Other plants	Sweet potato	*Ipomoea batatas*	Ibijumba	Farms	Moderate	Food

A2.3 Fauna Species Inventory

A2.3.1 General Faunal Characteristics

The fauna recorded in the project area is typical of:

- Agricultural landscapes
- Disturbed wetlands
- Peri-urban environments

Species are generally:

- Widespread and resilient
- Adapted to human presence
- Not of conservation concern

A2.3.2 Avifauna (Birds)

Birds are the most visible fauna group, especially in wetlands and farmland.

Table A2.2: Bird Species Inventory

Common Name	Scientific Name	Local Name	Habitat	IUCN Status	Remarks
Pied Crow	*Corvus albus*	Ibikona	Farms, settlements	Least Concern	Very common
Cattle Egret	*Bubulcus ibis*	Inyange	Wetlands, fields	Least Concern	Associated with livestock
Sacred Ibis	*Threskiornis aethiopicus*	Nyirabaraza	Wetlands	Least Concern	Common in marshy areas
Grey-headed Sparrow	*Passer griseus*	Ibishwi	Settlements	Least Concern	Very abundant
Long-crested Eagle	*Lophaetus occipitalis*	Samusure	Open land	Least Concern	Seen on poles / trees
Grey Heron	*Ardea cinerea*	–	Wetlands	Least Concern	Occasional
Hadada Ibis	*Bostrychia hagedash*	–	Wetlands / farms	Least Concern	Common

A2.3.3 Amphibians

Amphibians are common in moist environments, especially wetlands and irrigated farms.

Table A2.3: Amphibian Species Inventory

Common Name	Scientific Name	Habitat	IUCN Status	Remarks
Common Reed Frog	*Hyperolius viridiflavus*	Wetlands	Least Concern	Very common
African Common Toad	*Sclerophrys regularis*	Farms, wetlands	Least Concern	Widespread
African Clawed Frog	*Xenopus laevis*	Wetlands	Least Concern	Aquatic species
Grass frogs	*Ptychadena spp.*	Wetlands, moist grassland, farms	Not assessed (genus level)	Identified to genus only

A2.3.4 Reptiles

Reptiles are present but less frequently observed owing to their secretive nature.

Table A2.4: Reptile Species Inventory

Common Name	Scientific Name	Habitat	IUCN Status	Remarks
Speckled Bush Snake	*Philothamnus semivariegatus*	Vegetation, farms	Least Concern	Non-venomous
Brown House Snake	*Boaedon capensis*	Settlements	Least Concern	Harmless
Variable Bush Viper	*Atheris squamigera*	Vegetation	Least Concern	Venomous; infrequently observed
Black-necked Spitting Cobra	*Naja nigricollis*	Farms, settlements, open bush	Least Concern	Venomous; spits venom
Puff Adder	*Bitis arietans*	Farmland, grassland	Least Concern	Venomous
Common House Gecko	*Hemidactylus mabouia*	Buildings	Least Concern	Very common
Skinks	Scincidae	Farms, grassy and rocky areas	Not assessed (family level)	Identified to family only

A2.3.5 Other Fauna

Table A2.5: Other Fauna Recorded

Group	Common Name	Scientific Name	Remarks
Mammals	Rats	*Rattus* spp.	Common in farms
Mammals	Bats	Various species	Occasional
Invertebrates	Butterflies	Various species	Common
Invertebrates	Grasshoppers	Various species	Common

A2.4 Conservation Status Summary

- All species identified to species level are classified as Least Concern (LC) on the IUCN Red List; taxa recorded only to genus or family level (grass frogs, skinks and the groups in Table A2.5) have no single IUCN status
- No endangered, rare or endemic species were identified
- No species listed under Rwanda's protected species regulations were recorded

A2.5 Conclusion

The species inventory confirms that:

- The project area has low ecological sensitivity
- Biodiversity is dominated by common agricultural and wetland species
- No critical habitats or protected species are present
- Ecological functions are already significantly altered by human activity

This supports the conclusion that the project will have limited ecological impact, provided the mitigation measures are implemented.

Appendix 7: Biodiversity Management Plan (BMP)

Project: Construction of Double Circuit 110 kV Transmission Line (Cut-in/Cut-out) from the Existing Kigoma – Mt Kigali Transmission Line (21 km)

Abbreviations

Abbreviation	Meaning
AoI	Area of Influence
BMP	Biodiversity Management Plan
EDCL	Energy Development Corporation Limited
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESS6	World Bank Environmental and Social Standard 6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources)
ESS10	World Bank Environmental and Social Standard 10 (Stakeholder Engagement and Information Disclosure)
GRM	Grievance Redress Mechanism
IUCN	International Union for Conservation of Nature
LC	Least Concern (IUCN Red List category)
REG	Rwanda Energy Group
RoW	Right-of-Way
RURA	Rwanda Utilities Regulatory Authority
RWF	Rwandan Franc

1. Introduction

This Biodiversity Management Plan (BMP) has been prepared as part of the Environmental and Social Impact Assessment (ESIA) for the construction of a double circuit 110 kV transmission line (cut-in/cut-out) from the existing Kigoma – Mt Kigali transmission line (21 km). Its purpose is to ensure that biodiversity-related risks and impacts associated with the project are properly identified, assessed and managed throughout the project lifecycle, in line with national environmental regulations and World Bank Environmental and Social Standard 6 (ESS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources.

The BMP provides a structured framework for protecting terrestrial and aquatic biodiversity within the project area, including degraded wetlands and agricultural landscapes. It specifically responds to the requirement to consider seasonal variability (wet and dry seasons) in the biodiversity assessment, so that potentially sensitive habitats, species presence and ecological functions are adequately understood. Although the project area is largely modified by human activities, the BMP

ensures that precautionary measures are applied to avoid, minimize and manage any residual impacts on biodiversity.

2. Project Context and Area of Influence

The project involves the construction of a 21 km double circuit 110 kV transmission line, including a cut-in/cut-out connection from the existing Kigoma – Mt Kigali transmission line. The infrastructure will consist of approximately 69 towers, with a 25 m right-of-way (RoW) in accordance with Rwanda Utilities Regulatory Authority (RURA) guidelines. Land acquisition is limited to tower footprints, while the RoW will be subject to vegetation management restrictions.

The project is located in Muhanga and Ruhango Districts in the Southern Province of Rwanda. The transmission line traverses a predominantly agricultural and peri-urban landscape, including cultivated hillsides, scattered settlements and several degraded wetlands. In Muhanga District, the alignment passes near the boundary of the Muhanga Industrial Park and crosses Rugeramigozi wetland, while in Ruhango District it traverses several valley-bottom wetlands that are extensively used for crop production.

For the purpose of the biodiversity assessment, the Area of Influence (AoI) has been defined at two levels:

- **Direct Impact Area:** the tower footprints, working areas and the 25 m RoW, where vegetation clearing and construction activities will take place; and
- **Indirect Impact Area:** up to 500 m on either side of the transmission line, used to assess potential indirect effects on habitats, fauna movement and ecological connectivity.

The baseline assessment confirms that the AoI is characterized by highly modified ecosystems, with no legally protected areas or critical habitats intersected by the transmission line. However, wetlands and agricultural landscapes still provide ecological functions and habitat for common species, and these are addressed in this BMP.

3. Methodology for Biodiversity Assessment

3.1 Assessment Approach

The biodiversity assessment used an integrated approach combining field surveys, literature review and spatial analysis. The objective was to identify existing habitats, flora and fauna species, and any environmentally sensitive features within the project's AoI.

Field surveys were undertaken along the entire transmission line corridor, focusing on key ecological features such as wetlands, agricultural areas and zones with remnant vegetation. These surveys were complemented by a review of national biodiversity references, including protected species lists and available ecological data, as well as previous baseline studies conducted for the ESIA.

Consultations with local communities provided supplementary information on wildlife presence and historical land use patterns, which helped to validate field observations.

To capture seasonal variability, field surveys were conducted in three different seasons (Table 1) and complemented by literature review and ecological knowledge of the area.

Table 1: Seasonal Field Surveys

Season	Period	Survey Date
Long dry season	June – September	August 2025
Short rainy season	October – mid-December	December 2025
Short dry season	Mid-December – February	February 2026

Field surveys were conducted in three seasonal windows (August 2025, December 2025 and February 2026), covering the long dry season, the short rainy season and the short dry season. The long rainy season (March – May) was not sampled. Given the highly modified nature of the project area, which is dominated by agriculture and degraded wetlands, no significant differences in terrestrial biodiversity composition are expected between the wet and dry seasons. Seasonal variation is mainly limited to temporary increases in amphibian activity and waterbird presence during the rainy seasons. The December and February surveys also fall within the period when Palearctic migrant birds are present in Rwanda, so the survey timing allowed both resident and migratory species to be detected. No sensitive habitats or threatened species were identified in any surveyed season. The long rainy season will be covered during the pre-construction phase to confirm these findings, and any additional sensitive habitats or species recorded will be addressed in the ESMP.

3.2 Consideration of Seasonal Variability (Wet and Dry Seasons)

To address seasonal variability in biodiversity, the assessment took into account ecological conditions during both the wet and dry seasons that characterize the climate of the Southern Province of Rwanda.

During the wet season, ecological conditions are typically associated with:

- Increased vegetation growth and ground cover
- Seasonal water bodies and wetter soil conditions
- Higher activity of amphibians, birds and certain invertebrates
- Use of wetlands by birds for breeding and feeding

In contrast, the dry season is characterized by:

- Reduced surface water availability
- Lower vegetation density in some areas
- Reduced visibility and activity of certain fauna species
- Continued agricultural use of wetlands through residual moisture

Although each field survey represents a snapshot in time, the interpretation of results integrates seasonal ecological dynamics, so that species presence, habitat use and potential sensitivities are not underestimated. This is particularly relevant for wetlands and agricultural ecosystems, where biodiversity may fluctuate seasonally.

3.3 Survey Techniques

The field assessment relied primarily on walkover surveys along the proposed transmission line alignment and within the defined AoI. The following techniques were applied:

- **Direct observation** of flora and fauna, including birds, reptiles, amphibians and vegetation types
- **Habitat characterization**, identifying land use types such as cultivated land, wetlands and settlements
- **Identification of ecologically sensitive features**, including wetland areas and zones with higher vegetation density
- **GPS-referenced points** to validate key locations and align findings with project maps

Particular attention was given to wetland crossings and areas of relatively higher ecological value, although these were found to be largely degraded.

3.4 Data Sources

The biodiversity assessment was informed by multiple sources, including:

- Primary data from field observations along the transmission line corridor
- National legal and policy frameworks, including Ministerial Order No. 007/2008 of 15/08/2008 establishing the list of protected animal and plant species in Rwanda
- International references such as the IUCN Red List of Threatened Species, used to determine conservation status
- Existing ESIA baseline information and environmental studies relevant to the project area

Together, these sources support the conclusion that the project area hosts mainly common and widely distributed species, with no endangered or protected species identified within the AoI.

4. Baseline Biodiversity Conditions

4.1 Habitat Types and Ecological Setting

The project AoI is a highly modified landscape dominated by agriculture and human settlements. Natural habitats have largely been converted to farmland and peri-urban land uses, resulting in limited ecological integrity and reduced biodiversity value.

The main habitat types identified along the transmission line corridor are:

- **Agricultural land (dominant habitat):** the predominant land use, consisting of crops such as maize, beans, cassava and potatoes. These areas provide limited habitat for wildlife but support common bird species and small fauna adapted to human-modified environments.
- **Degraded wetlands:** six wetlands are crossed by the transmission line, five in Ruhango District and one (Rugeramigozi) in Muhanga District. All have been fully converted to agricultural use, mainly for maize and other seasonal crops. Natural wetland vegetation such as papyrus is absent, and ecological functions are significantly altered.
- **Agroforestry and scattered trees:** the landscape includes scattered trees, predominantly *Eucalyptus* and grevillea, as well as fruit trees such as avocado, mango and guava. These provide limited ecological niches for birds and small fauna.
- **Settlements and peri-urban areas:** especially in Muhanga District, the transmission line passes near built-up areas and the boundary of the industrial park, further reducing the availability of natural habitat.

Overall, no natural forests, protected areas or critical habitats were identified within the project corridor or its 500 m buffer.

4.2 Flora

Flora within the project area is dominated by cultivated crops and planted tree species, reflecting intensive land use.

4.2.1 Dominant Vegetation

- **Food crops:** maize (dominant), beans, cassava, potatoes, sweet potatoes and bananas
- **Wetland crops:** maize, colocasia, sugarcane and seasonal vegetables
- **Grasses:**
  - *Pennisetum purpureum* (elephant grass), used for erosion control
  - *Pennisetum clandestinum* (Kikuyu grass), dominant in wetter zones such as Urugondo

4.2.2 Tree Species

- **Dominant species:** *Eucalyptus* spp.
- **Common associated species:**
  - *Grevillea robusta*
  - Fruit trees: avocado (*Persea americana*), mango (*Mangifera indica*), guava (*Psidium guajava*) and *Citrus* spp.



Figure 1: Tree and crop cover around the wetlands, including *Eucalyptus*

4.2.3 Conservation Status

Field observations and review of Ministerial Order No. 007/2008 confirm that:

- No protected or endangered plant species were identified
- No natural wetland vegetation (e.g. papyrus) exists within the AoI

4.3 Fauna (Wildlife)

4.3.1 Birds

Bird species observed in the project area are typical of agricultural and wetland-edge environments and are generally well adapted to human presence. Common species include:

- Pied Crow (*Corvus albus*)
- Cattle Egret (*Bubulcus ibis*)
- Sacred Ibis (*Threskiornis aethiopicus*)
- Grey-headed Sparrow (*Passer griseus*)
- Long-crested Eagle (*Lophaetus occipitalis*)
- Grey Heron (*Ardea cinerea*)
- Hadada Ibis (*Bostrychia hagedash*)

All of these species are classified as Least Concern (LC) on the IUCN Red List, indicating stable populations and low conservation risk.



Figure 2: Common bird species recorded in the project area

4.3.2 Amphibians and Reptiles

The project area supports common amphibians and reptiles associated with agricultural and wetland environments, including:

- **Frogs:** Common Reed Frog (*Hyperolius viridiflavus*), grass frogs (*Ptychadena* spp.) and African Clawed Frog (*Xenopus laevis*)
- **Toads:** African Common Toad (*Sclerophrys regularis*, formerly *Amietophrynus*)
- **Snakes:** Speckled Bush Snake (*Philothamnus semivariegatus*), Brown House Snake (*Boaedon capensis*), Variable Bush Viper (*Atheris squamigera*), Black-necked Spitting Cobra (*Naja nigricollis*) and Puff Adder (*Bitis arietans*)
- **Lizards:** Common House Gecko (*Hemidactylus mabouia*) and skinks

All species identified to species level are classified as Least Concern (LC) on the IUCN Red List; grass frogs and skinks were identified only to genus or family level, so no single IUCN status applies. All are widely distributed and are not considered threatened. A full inventory is provided in Appendix 6 (Wetland Management Plan), Annex 2.



Figure 3: Common amphibian species recorded in the project area

4.3.3 Mammals

Large mammals are absent owing to habitat transformation. Observations indicate the presence of:

- Small rodents
- Occasional bats

These species are typical of agricultural landscapes and are of low conservation concern.

4.4 Sensitive Areas and Conservation Status

- No protected areas, national parks or forest reserves are located within or near the project area
- No critical habitats, as defined under World Bank ESS6, were identified
- All wetlands are degraded and cultivated, with no intact ecological structure
- No endangered or protected species were recorded

The biodiversity value of the project area is therefore **low**, with ecosystems already significantly modified by human activities.

5. Impact Assessment on Biodiversity

5.1 Construction Phase Impacts

5.1.1 Vegetation Clearance

- Clearing of vegetation within the 25 m RoW
- Removal of trees (mainly *Eucalyptus* and fruit trees)
- Loss of crops and grasses

Impact significance: Low to moderate (localized and temporary)

5.1.2 Habitat Disturbance

- Temporary disturbance to fauna due to:
  - Noise
  - Human presence
  - Movement of machinery
- Possible displacement of small animals (birds, reptiles, amphibians)

Impact significance: Low (species are mobile and adapted to disturbance)

5.1.3 Impacts on Wetlands

- Temporary disturbance during crossing works
- Risk of:
  - Soil erosion
  - Sedimentation
  - Localized pollution (fuel / oil spills)

Impact significance: Low to moderate (wetlands are degraded but hydrologically sensitive)

5.1.4 Soil Erosion and Habitat Degradation

- Excavation for tower foundations may:
  - Increase erosion
  - Affect vegetation recovery

Impact significance: Moderate (if not controlled)

5.2 Operation Phase Impacts

5.2.1 Avian Collision and Electrocution

Birds may collide with overhead transmission lines, particularly when crossing wetland areas. However, the risk is considered low due to the low observed bird density and the absence of identified migratory corridors. Electrocution risk on the 110 kV transmission line is also expected to be low because of the relatively large clearances between energized components and grounded structures, provided the tower design complies with applicable electrical safety standards.

Impact significance: Low

5.2.2 Vegetation Maintenance

- Periodic clearing within the RoW
- Prevention of natural vegetation regeneration

Impact significance: Low (the area is already managed and cultivated)

5.2.3 Habitat Fragmentation

- Minimal, as the landscape is already fragmented

Impact significance: Negligible

5.3 Cumulative Impacts

Given:

- Existing land use (agriculture, settlements)
- The absence of natural habitats

the project's contribution to cumulative biodiversity impacts is **negligible to low**.

6. Mitigation Measures

The mitigation measures follow the mitigation hierarchy (avoid, minimize, restore, compensate) and are adapted to the low biodiversity sensitivity of the project area, while protecting the remaining ecological functions, particularly in wetlands.

6.1 General Principles

- Avoid sensitive areas where feasible (already applied during routing)
- Minimize vegetation clearing and habitat disturbance
- Restore disturbed areas promptly after construction
- Prevent pollution and degradation of wetlands and soils
- Promote worker awareness of biodiversity protection

6.2 Mitigation Measures during the Pre-Construction Phase

- Confirm the final alignment to ensure:
  - No tower is placed within wetlands (already achieved)
  - Steep slopes and erosion-prone areas are avoided
- Mark the RoW and tower locations to limit unnecessary clearing
- Complete the biodiversity survey for the long rainy season (March – May) before construction commences at the wetland crossings, and address any additional sensitive habitats or species recorded in the ESMP
- Sensitize contractors and workers on:
  - The prohibition of hunting, trapping or harming wildlife
  - Protection of vegetation outside designated work areas

6.3 Mitigation Measures during the Construction Phase

6.3.1 Vegetation and Flora Protection

- Restrict vegetation clearing strictly to the 25 m RoW and tower footprints
- Avoid clearing trees outside designated areas
- Prune selectively instead of removing vegetation completely, where feasible
- Stockpile and reuse topsoil for site restoration

6.3.2 Wetland Protection Measures

- Ensure no towers are installed within wetlands
- Maintain natural water flow across wetlands during construction
- Avoid the use of heavy machinery within wetland areas as far as possible
- Install erosion and sediment control measures:
  - Silt fences
  - Temporary drainage channels
- Prohibit dumping of excavated material in wetlands
- Store fuels, oils and chemicals away from water bodies

6.3.3 Fauna Protection

- Prohibit hunting, poaching or disturbance of wildlife by workers

- Limit construction activities to daytime to reduce disturbance
- Avoid unnecessary noise and movement in wetland areas
- Ensure proper waste management to avoid attracting animals

6.3.4 Soil and Erosion Control

- Stabilize excavated areas immediately after works
- Revegetate disturbed areas using local plant species
- Avoid construction during heavy rainfall where possible
- Use controlled access routes to prevent widespread land disturbance

6.3.5 Pollution Prevention

- Keep spill kits on site at all times
- Contain and clean up any spills immediately
- Store and handle hazardous materials properly
- Dispose of construction waste properly

6.4 Mitigation Measures during the Operation Phase

6.4.1 Vegetation Management

- Implement controlled vegetation maintenance within the RoW:
  - Promote low-growing vegetation
  - Avoid unnecessary clearing
- Prohibit the use of harmful chemicals (herbicides) unless strictly necessary

6.4.2 Avifauna Protection

- Install bird diverters / markers on transmission lines at wetland crossings (especially Rugeramigozi wetland)
- Monitor bird interactions with the line

6.4.3 Maintenance Practices

- Inspect towers and lines regularly to prevent environmental risks
- Repair immediately any damage that could affect surrounding habitats
- Maintain good housekeeping practices at all times

6.5 Residual Impacts

After implementation of the mitigation measures:

- Residual impacts on biodiversity are expected to be low to negligible
- No significant or irreversible impacts are anticipated

7. Biodiversity Monitoring Plan

The Biodiversity Monitoring Plan is designed to ensure that mitigation measures are effectively implemented and that no unexpected impacts on biodiversity occur during project implementation.

7.1 Monitoring Objectives

- Verify compliance with biodiversity mitigation measures
- Track changes in vegetation and habitat conditions
- Monitor potential impacts on fauna, especially birds
- Ensure protection of wetlands and their ecological functions

7.2 Monitoring Plan

Table 2: Biodiversity Monitoring Plan

Parameter	Indicator	Location	Method	Frequency	Responsible Entity
Vegetation clearance	Area cleared vs. planned RoW	Entire transmission line	Site inspection	Weekly during construction	Contractor / Supervising Engineer
Site restoration	% of disturbed areas rehabilitated	Tower sites, access routes	Visual inspection	Monthly	Contractor / Environmental Specialist
Wetland condition	Evidence of erosion, sedimentation or pollution	All wetland crossings	Field inspection	Weekly (construction); quarterly (operation)	Contractor / Project Environmental Officer
Water quality (qualitative)	Turbidity; oil spills	Wetlands and nearby streams	Visual observation	Weekly during construction	Contractor
Wildlife disturbance	Presence / absence of fauna	Along RoW and wetlands	Observation during site visits	Monthly	Environmental Specialist
Bird collision risk	Bird mortality or evidence of collision	Wetland crossing areas	Transect walk surveys	Quarterly	Project Operator
Bird diverters	Installed / not installed	Wetland crossing spans	Physical verification	Once at installation, then annually	Project Operator
Waste management	Presence of unmanaged waste	Construction sites	Inspection	Weekly	Contractor
Worker compliance	Awareness of and adherence to biodiversity rules	Construction sites	Spot checks / interviews	Monthly	Supervising Engineer

Parameter	Indicator	Location	Method	Frequency	Responsible Entity
Seasonal confirmation survey	Long rainy season survey completed; any additional sensitive habitats or species recorded	Entire alignment and wetland crossings	Walkover survey	Once, before construction commences at wetland crossings	Environmental Specialist

7.3 Adaptive Management

If monitoring identifies unexpected impacts:

- Mitigation measures will be reviewed and strengthened
- Additional controls may be introduced, such as:
  - Enhanced erosion control
  - Additional bird protection devices
  - Increased monitoring frequency

8. Institutional Arrangements and Responsibilities

Effective implementation of the BMP requires clearly defined roles and coordination among all stakeholders involved in the project.

8.1 Key Institutions and Roles

- **Project Developer (REG/EDCL):** overall responsibility for BMP implementation and compliance with national regulations and World Bank ESS6, and for ensuring adequate resources are allocated.
- **Supervising firm:** day-to-day supervision of contractor activities, ensuring that biodiversity mitigation measures are implemented as specified, and verifying compliance through regular site inspections.
- **Contractor:** directly responsible for:
  - Implementation of all mitigation measures during construction
  - Environmental compliance at site level
  - Worker training and awareness on biodiversity protection
  - Reporting on environmental performance
- **Environmental and Social Specialists:** technical oversight, monitoring, audits and support for adaptive management where necessary.
- **Local authorities (district and sector levels):** support for monitoring, facilitation of community engagement, and alignment with local environmental management priorities.

8.2 Capacity Building

To ensure effective implementation:

- Environmental training will be provided to contractors and workers, covering:
  - Biodiversity protection measures

  - Wetland conservation practices
  - The prohibition of hunting and illegal resource use
- Site supervisors will receive specific training on:
  - Monitoring requirements
  - Reporting procedures
  - Incident management

9. Reporting and Documentation

9.1 Reporting Requirements

The following reports will be prepared:

- **Monthly environmental reports (construction phase),** including:
  - Status of mitigation measures
  - Monitoring results
  - Non-compliance issues and corrective actions
- **Quarterly environmental reports (operation phase),** including:
  - Vegetation management status
  - Monitoring of bird interactions
  - Wetland condition observations

Any non-compliance identified through monitoring will trigger immediate corrective action and follow-up monitoring.

9.2 Incident Reporting

Any environmental incident (e.g. a spill, unauthorized clearing or harm to wildlife) will be:

- Reported immediately to the Supervising Engineer and the Project Developer
- Documented with:
  - A description of the incident
  - Its location and cause
  - Corrective actions taken

10. Grievance Redress Mechanism (GRM) Related to Biodiversity

Although biodiversity impacts are limited, communities may raise concerns regarding:

- Tree removal
- Wetland disturbance
- Environmental degradation

10.1 Mechanism

- Complaints will be received through the project GRM
- Issues will be recorded, assessed and addressed promptly
- Feedback will be provided to complainants within the response times set out in the project-wide GRM

10.2 Integration with the Project GRM

This BMP will rely on the project-wide GRM already established under ESS10, ensuring:

- Accessibility for all stakeholders
- Transparency and accountability

11. Budget for Biodiversity Management

Implementation of the BMP will be integrated into the overall Environmental and Social Management Plan (ESMP) budget.

11.1 Indicative Budget Items

Table 3: Indicative Budget Items

Item	Description	Estimated Cost (RWF)
Training and awareness	Worker training on biodiversity protection	Included in the ESMP
Monitoring activities	Field inspections and reporting	Included in the ESMP
Erosion control measures	Silt fences, stabilization works	Included in construction costs
Wetland protection measures	Site-specific controls at crossings	Included in construction costs
Bird diverters	Installation on selected spans	Included in construction costs

The detailed costs are provided in Table 24 (Environmental and Social Management Plan for the 110 kV Transmission Line) and Table 28 (Environmental and Social Monitoring Plan) of the ESIA.

Note: All costs are integrated within the project construction and supervision contracts to ensure implementation.

12. Conclusion

This Biodiversity Management Plan demonstrates that:

- The project is located in an area of low ecological sensitivity, dominated by agriculture and human activities
- No critical habitats, protected areas or endangered species are affected
- All wetlands within the project area are already degraded and under cultivation

Potential impacts on biodiversity are:

- Localized and temporary (construction phase)
- Low and manageable (operation phase)

With implementation of the proposed mitigation and monitoring measures:

- Biodiversity impacts will be effectively controlled
- Ecological functions, particularly in wetlands, will be maintained

- The project will remain fully compliant with national regulations and World Bank ESS6

13. Annexes

The following annexes support this BMP:

- **Annex A: Detailed Species Inventory** (see Appendix 6: Wetland Management Plan, Annex 2)
  - Flora and fauna tables
- **Annex B: Wetland Maps** (not reproduced in this report owing to their number and size; available separately from the report on request)
  - Individual maps for Rugeramigozi, Gasenyi–Rwamikara, Kamugongo–Bakoni–Kamonyi–Gahengeri, Nyabikone, Nyamugafi and Urugondo wetlands
- **Annex C: Monitoring Forms** (provided at the end of this appendix)
  - Standard templates for field inspections
  - Biodiversity monitoring checklist

Annex C: Biodiversity Monitoring Checklist

This checklist is the standard template for field inspections during the construction and operation phases. One form is completed per inspection and filed with the monthly (construction) or quarterly (operation) environmental report.

Inspection date: _____ Location (tower no. / wetland): _____

Inspector (name and organization): _____ Project phase: Construction / Operation

Inspection item	Compliant (Yes / No / N/A)	Observations and corrective action
Vegetation clearance restricted to the 25 m RoW and tower footprints		
Topsoil stockpiled and reused for restoration		
Disturbed areas rehabilitated or stabilized		
No erosion, sedimentation or pollution observed at wetland crossings		
No oil or fuel spills; spill kits available on site		
Fuels, oils and chemicals stored away from water bodies		
No dumping of excavated material in wetlands		
No hunting, trapping or disturbance of wildlife by workers		
Waste managed properly; no unmanaged waste on site		
Workers aware of and following biodiversity rules		
Bird diverters installed at wetland crossing spans		
Evidence of bird collision recorded (operation phase)		

Overall observations and follow-up actions:

_____

Signature: _____ Reviewed by (Supervising Engineer):

_____